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JUNE 1935

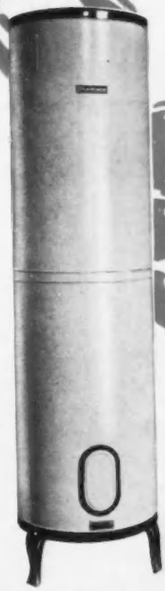
ELECTRICAL WEST

YOUR PROBLEM

OUR ANSWER

Utility Men! Distributors! Dealers! Your *future* needs should be part of *today's* plans! To meet the problems of billions of new KWH's, you owe it to your firm to investigate Thermador products. For nearly 20 years we have been a dependable source of load-building and current consuming devices for home and industry.

That the West's far-sighted Electrical Organizations recognize and appreciate our efforts to build load, add revenue, profitable sales, satisfied customers is attested by the increasing number of Thermador installations. Thermador products are modernized today—to meet your problems of tomorrow! Wire or write for the complete Thermador story.



THERMADOR PRODUCTS

Fan-Type Wall Insert.. Bathroom Wall Insert, Fan-Type..Bathroom Radiant, Convection Type..Portable Fan-Type..Portable Heat-Fan..Kitchen Heat-Fan ..Speed-Ray Portable Radiant, Convection Type..Long Radiant Bathroom Heater. Also a complete line of Electric Water Heaters.

A type and size for every installation.

Thermador

AIR HEATERS • WATER HEATERS

★ A Seven League Step in the Science of Electric Heating

THERMADOR ELECTRICAL MANUFACTURING COMPANY, LOS ANGELES, CALIF.

Your Side
OF THE METER

HALF a million meters in Edison territory invite you to ring up profits on your cash registers from the sale of new equipment.

Twenty-three hydro-electric plants and five steam generating units on our side of these meters are ready to activate any aggregate of equipment you can connect to your side.

With improving economic conditions as a foundation for renewed enthusiasm and resourcefulness, manufacturers, dealers and contractors have a splendid, present opportunity to capitalize this half-million customer market.

Edison advertising—better than ever before in plan, purpose, volume and extent—is directing customer attention to your products and services. That's as far as we can go.

We are on our side of the meters. The other sides—half a million—are yours.

SOUTHERN CALIFORNIA EDISON COMPANY LTD.

Not Affiliated with Any Holding Company

6-35

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Sales Talks that SOLD Appliances

CASE HISTORY NO. 6

"DOORBELL PUSHING" is a fine way to develop prospects and clinch extra orders. Like most salesmen, Bill frequently finds himself confronted with the situation where the woman asks him to call back in the evening to discuss the sale with her husband. On a call the previous day, Bill was convinced that he had sold Mrs. Jones on the advantages of owning an electric range but she had asked him to call back the next evening. The husband refused to be moved by every sales point that Bill could muster until finally he hit the bull's eye with a point that every dealer should use to sell ranges and other major appliances. Bill has just rung Mrs. Jones' doorbell.

MRS. JONES: "Oh, good evening, Mr. Smith, please come right in here to the living room. John, this is Mr. Smith, who was telling me about electric cookery."

MR. JONES: *(putting down his paper)* "How are you, Mr. Smith? Nice weather we're having, isn't it?"

BILL: *(quickly converting an opening about good weather to a sales point on the leisure made possible by an electric range)* "Yes, it's certainly grand weather. That's one reason why I took the liberty of calling to tell Mrs. Jones about one of the big advantages of owning an electric range which will cook the meals while she enjoys the afternoons picnicking with the children or otherwise taking advantage of this fine summer sunshine. Did you know that the automatic features of electric cookery which account for its popularity with thousands of women, make it possible to prepare an entire meal without any attention at all?"

MR. JONES: "No, I didn't, but I suppose almost anything is possible these days. I wish someone would invent a gadget to run my business. I'd like to get a little more time on the golf links. You play?"

¶ **Here the prospect injects a question that is liable to divert a green saleman's attention from his job and get him talking about divots instead of ranges. Watch Bill retain command of the situation, first by courteously answering the prospect's question and then bringing the conversation back to the main topic.**

BILL: "Yes, I play a little on the weekends, but I'm pretty much of a dub—so much so that even my wife gives me some pretty stiff competition. You see she claims that her electric range improved her game ten strokes by letting her get out all afternoon instead of keeping her in a hot kitchen getting my dinner. There are a lot more pleasant places than the kitchen these warm summer days, don't you agree, Mr. Jones?"

MRS. JONES: "Yes, indeed. I always envy my friends who don't have to rush home and start dinner. To my notion, that's one of the biggest advantages of an electric range."

BILL: "It's a big advantage but there are many more beside leisure and comfort. For instance, food cooked electrically not only is more appetizing and tasty, but also more healthful and nourishing because it is possible to cook with so little water that the nutritious elements in the food are not boiled away. Retaining the vitamins and other essential elements is most important in maintaining the health of those two fine youngsters of yours. You'd be surprised, too, how much better a dinner prepared on an electric range tastes, Mr. Jones."

MR. JONES: "Well, I don't know about that. Mrs. Jones here is a mighty fine cook. It seems to me it's the cook and not the stove that makes good food."

BILL: "Mrs. Jones, that's a high compliment and I am sure Mr. Jones is right about your culinary art, but you'll agree with me that there is a great deal in the way food is cooked. Take baking now. The perfect temperature control and even heat of the electric elements cannot help but bring better results. Mr. Jones, you probably have every modern business machine to make your office more efficient. Isn't it just as reasonable to give your wife the modern tools that will make her work more efficient, give her more leisure, and at the same time enable her to make the most of her excellent ability as a cook?"

MR. JONES: "Yes, I suppose it is but we're getting along pretty well with our present stove. Business hasn't been so good and we can't afford to make a big investment right now, particularly when it's for something that is not absolutely essential. Don't you think that's right, Mary?"

MRS. JONES: *(doubtfully)* "You know best about that, dear, but I do think it would be nice to have a new range. How much did you say a good one costs, Mr. Smith?"

BILL: "Finish and size determine the price, but the leisure, convenience, comfort and economy of electric cookery can be obtained from any model. We carry several models." *(Here Bill takes out*

his catalog and shows several models, explaining the difference between each and finally suggesting a medium priced model that he thinks would suit the requirements of the family.)

MR. JONES: "That's a lot of money in these times. I think we had better wait until we have the cash before getting it. I hate to go in debt for something like this."

BILL: "I agree that it is quite a lot of money but everyone wants to spend wisely these days. Besides bringing added convenience and leisure to your wife, and more wholesome, healthful and nutritious meals for the family, it actually saves money. That's why this range is a good investment. You see, electric heat is much cleaner than other fuels which saves the work and cost of frequent redecoration in the kitchen. Also, economical is the fact that foods do not cook away or shrink with electric cookery. You wouldn't need cash to put this handsome modern convenience in your kitchen either. Our company has a convenient budget purchase plan that makes it possible to buy electrical appliances on small monthly payments."

MR. JONES: "I don't like to buy things on time, and besides I am sure that this house is not wired for an electric range. That would add a lot more to the price, wouldn't it?"

BILL: *(smiling)* "That used to be the case. but now the power company makes it easy to have the wiring done."

MR. JONES: *(grudgingly)* "That's something anyway, but how about our electric bill? A gadget like that would send it sky high."

BILL: "I can see where you might think that, but just as quantity purchase benefits from lower price, the power company's rates for electric range users, which not only apply to the power used for cooking but for all the other uses in the house, such a lights, radio and other uses, become lower as more equipment is used. Here is my last month's electric bill. There are four of us in the family, and you can see here it costs us only around $5.50 for cooking, lighting and everything."

MR. JONES: "I can see where the electric range has many advantages, but I am afraid that we will have to get along with our present stove until times get a little better. It was mighty nice of you to come up and tell us about it, though. Just as soon as business improves and we get a little spare cash Mrs. Jones will come down and see you about this range."

¶ To the average salesman, it would seem that Mr. Jones had definitely made up his mind not to buy the range at this time, his final statement practically closing the interview. However, Bill has one final argument that he is going to try before he leaves.

BILL: "I am mighty sorry that you can't see your way clear to take advantage of this modern convenience right now, Mr. Jones, and I am sure Mrs. Jones is looking forward to the time when she will be cooking electrically. I can see how you feel, though, about financing such a purchase at this time. However, did you know, Mr. Jones, that you could borrow the entire amount necessary to buy this range from the government at a long-term, low-interest rate through the Federal Housing Act? Lots of people have financed the purchase of new appliances that way and it has helped business a great deal in this vicinity."

MR. JONES: (*more interested*) "Why, I thought that this act applied only to revamping the building itself. Are you sure that we could get an electric range that way?"

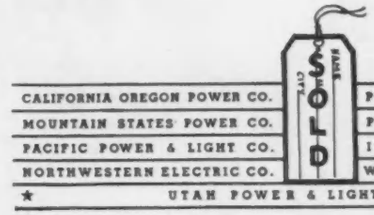
BILL: "Absolutely. The act covers both the building and permanent fixtures, and the electric range is classed as a permanent fixture."

MR. JONES: "What do you know about that, Mary! You know I wouldn't mind taking advantage of that scheme. We could get that range for you and help business along a little to boot. How much red tape is involved in getting a loan, Mr. Smith?"

BILL: *(smiling)* "Very little. I have an application blank right here with me. All you have to do is to sign it and I'll take care of the details at your bank. If you'll tell me where you do your banking, Mr. Jones, I can fill in this blank right now and the money will be available within a day or two, I am sure. In the meantime we could have the range connected up so that you folks can begin enjoying the advantages of electric cookery immediately."

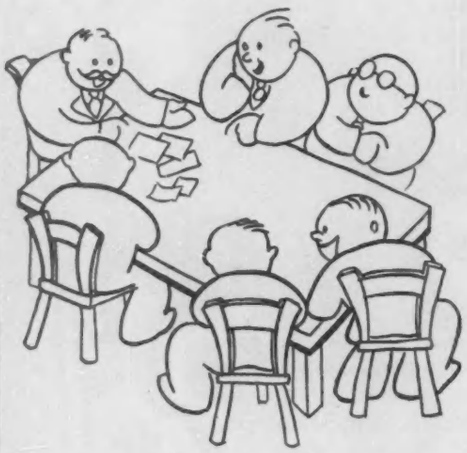
MR. JONES: "That's a deal. I am pretty sure that Mrs. Jones would have been disappointed if we hadn't bought the range, but until you mentioned the Housing Act I couldn't see just how we could afford to put the money into it right now."

¶ Bill has pointed out a fine moral in Field Selling—Don't be in a hurry to leave your prospect once you have gotten in the house. A good Salesman has much to offer the buyer.

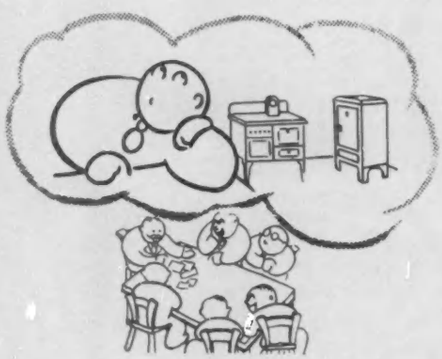


CALIFORNIA OREGON POWER CO. | PORTLAND GENERAL ELECTRIC CO.
MOUNTAIN STATES POWER CO. | PUGET SOUND POWER & LIGHT CO.
PACIFIC POWER & LIGHT CO. | IDAHO POWER COMPANY
NORTHWESTERN ELECTRIC CO. | WASHINGTON WATER POWER CO.
★ UTAH POWER & LIGHT COMPANY ★

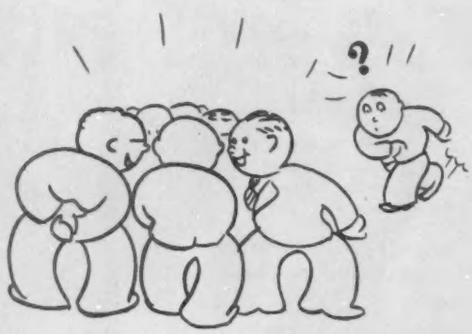
SO WE GOT OUR H



ROUND the table... our Monday morning meeting... mapping out bigger and better plans for Bargain Price Electricity ... more advertising... more publicity... more this... more that... and then someone remembered ... what about the retail dealer?



Aren't we forgetting him?... after all, the main idea is to help him sell appliances... why stop the campaign outside his door?... why not bring it inside, where he can use it? ... let's give more thought to tying the dealer in... that's our next job.



So we got our heads together... the man was right... it was our job to make people think of Bargain Price Electricity, even when they were in the dealer's store... but what kind of sales-helps will do the trick... what does the dealer want?... then someone suggested...

Why Not Ask the Dealer and Let Him Decide?

GRAB TH
AND CA

P·G·

PACIFIC GAS AND
Owned, Operated, Ma

HEADS TOGETHER

A KEY LINE

The first thing we need, dealers told us, is a key-line . . . just a few words to identify our stores with the central campaign. For example: "Electricity at Bargain Prices—Ask Our Salesmen."

MATS and CLIP SHEETS

Then, if we could have this "line" typeset and matted in a variety of styles and sizes, it would facilitate using it in our newspaper advertising. Of course, we'd need clip-sheets too.

DISPLAY CARDS

Next, we ought to have something on our floors and in our windows to attract attention and to make people ask about Bargain Electricity. A big, easel-back display card would probably do the trick.

PRICE TAGS

Another problem is the shopper who insists on "just looking around." There's only one place to catch his eye, and that's on the price tag itself. With a special price tag, we could stop these bargain hunters right in their tracks.

POCKET CARDS

And then there's the shopper who wants proof that Bargain Electricity is cheap. What is needed here are some air-tight examples, printed on pocket-size cards. Every salesman would welcome a "convincer" like this.

LITERATURE

Finally, dealers told us, we need literature. Most people won't buy until they talk it over at home. Before they get there, the story is confused or forgotten. A couple of good leaflets should see it safely home.

Okeh! Gentlemen—Your suggestions have all been followed. The material is all ready . . . . and

IT'S ALL Free!

AB TH AT PHONE
ND CA LL THE

G. and E.

ELECTRIC COMPANY

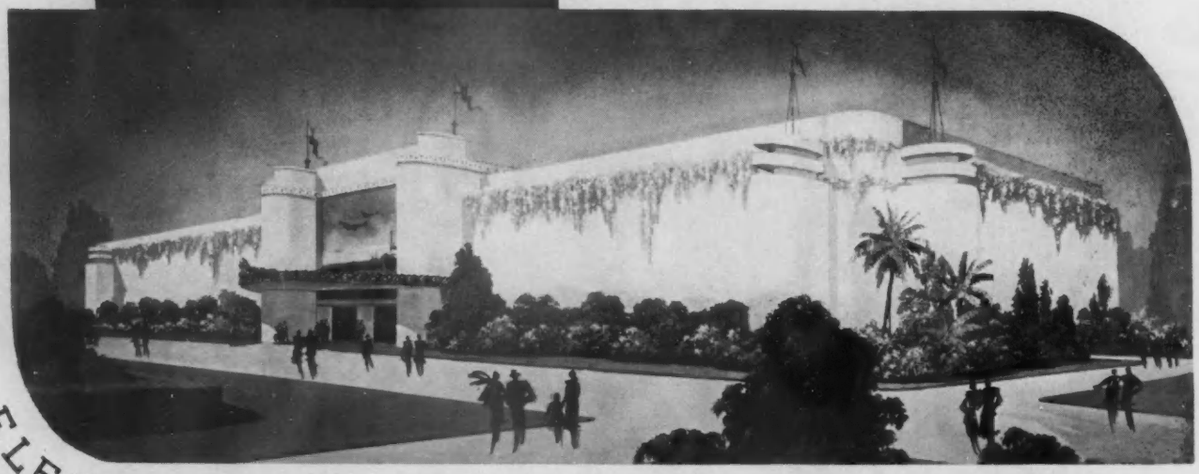
naged by Californians

EW-106-635

ELECTRIC INDUSTRY'S *Rendezvous*

GREETINGS to our friends and associates who constitute the electrical industry--a glorious empire whose very existence is dedicated to better living. We accept with pleasure the privilege of being your host throughout America's Exposition of 1935.

Contrasting the glittering splendor of former international shows, the San Diego Exposition is employing electricity to paint an indelible picture of pleasing beauty making practical use of the most advanced study in the field of mechanics and illumination.



PALACE OF ELECTRICITY & VARIED INDUSTRIES•

Please consider this both an invitation and an assurance that your visit among us will be thoroughly enjoyed and long remembered.

W. F. Raber, President
SAN DIEGO CONSOLIDATED GAS & ELECTRIC COMPANY

Last year, appliance sales records in this white spot were smashed. This year, with abundant rainfall increasing the area's crop values by at least $20,000,000 (conservative estimates), these prosperous folk will have $20,000,000 more to spend.

How much of that extra twenty million will you get? The share which will go to the electrical industry for refrigerators, ranges, laundry equipment and table appliances—instead of to some other industry—depends on you.

We've given you real sales tools: (1) Reduced Rates, (2) ½ Off on Extra Use, (3) Lower Rate Offer for rural customers, and (4) a hard-hitting promotional campaign. We're backing you to the limit for a record-breaking 1935.

SAN JOAQUIN LIGHT AND POWER CORPORATION

A MORE ABUNDANT LIFE

● **THE NORTHWEST! The opportunity in this country is great. The Northwest Electric Light and Power Association has in its keeping one of the flaming torches dedicated to the service of human progress.**

Its possession carries the definite responsibility of continuing the development which this country has enjoyed as well as to maintain the high standard of service to the people.

Every Home a *Fully* Electrified Home

What ambition fulfilled could make for a more abundant life than this?

It will require the very best efforts and complete coordination of every branch of industry and the persons connected with them to make this possible.

As an individual residing in Washington, Oregon, Utah, Montana, Idaho, or British Columbia, you are eligible to membership in the Association, eligible to help the others carry the Torch. In doing so you help yourself.

Let us give you full details about the value of membership in this Association and the value to the Association of your membership.

NORTHWEST ELECTRIC LIGHT and POWER ASSOCIATION

707 Spalding Building — Portland, Oregon

This title doesn't refer to a suit of clothes. It refers to the double advantages that accrue from a membership in the Pacific Coast Electrical Association. The Association and the Pacific Coast Electrical Bureau have been combined into one organization—membership in the Association now brings you the full benefits of both.

Membership in the Association covers a subscription to Electrical West, your own industry's magazine . . . gives you the right to attend conclaves and take part in its conferences, to participate in its contests, to secure the many benefits of intimate industry contacts which will bring you profits.

On the other hand, the cooperative advertising campaign of the Pacific Coast Electrical Bureau is constantly opening up new channels for increased business for all members. The Bureau also gives you the advantages that accrue from its Red Seal activities, and its ordinance work on adequate wiring and substandard appliances.

Today there are over 2,300 members in the Association. If your name is not already on the list join immediately—it belongs there for your own advancement and the progress of the industry.

Pacific Coast Electrical Association

447 Sutter Street, San Francisco ★ **601 West 5th Street, Los Angeles**

ITELITE*

pronounced EYÉ-TE-LĪTÉ

*** A full line of Thermal Type Circuit Breakers Providing Reliable I-T-E Protection for Light and Power Circuits.**

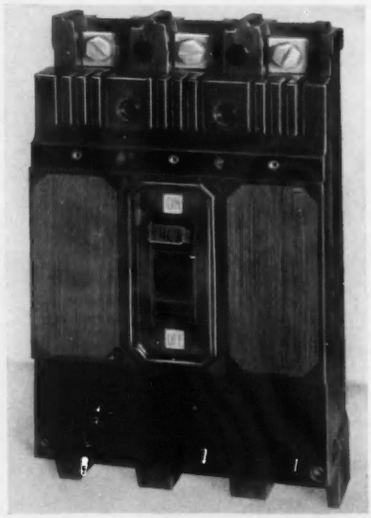
RELIABILITY, safety, convenience and economy in small circuit breakers have been achieved by I-T-E engineers. Since 1888 I-T-E carbon circuit breakers have set the standard of performance and protection for the electrical industry.

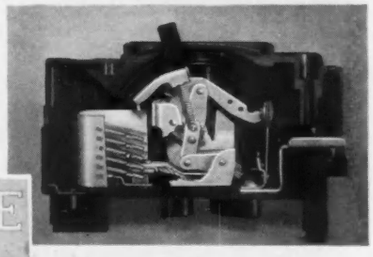
Now I-T-E engineers backed by our 45 years of specialized experience have developed and perfected the ITELITE Thermal Type Circuit Breakers for industrial, commercial and domestic application.

To insure long life and reliable electrical and mechanical action, ITELITE is built to the highest standards as is evidenced by positive toggle action, accurately calibrated bimetal thermal element inclosed in an attractive Hot Moulded bakelite case. Design permits its use in either single units or in gangs for panelboard installations. Available sizes range from 15 to 600 amp. and voltages up to 250 d.c. and 600 a.c.

Refuse to Re-fuse. Instead call upon our engineering department to aid you in the selection and the application of the right I-T-E circuit breaker to meet your requirements.

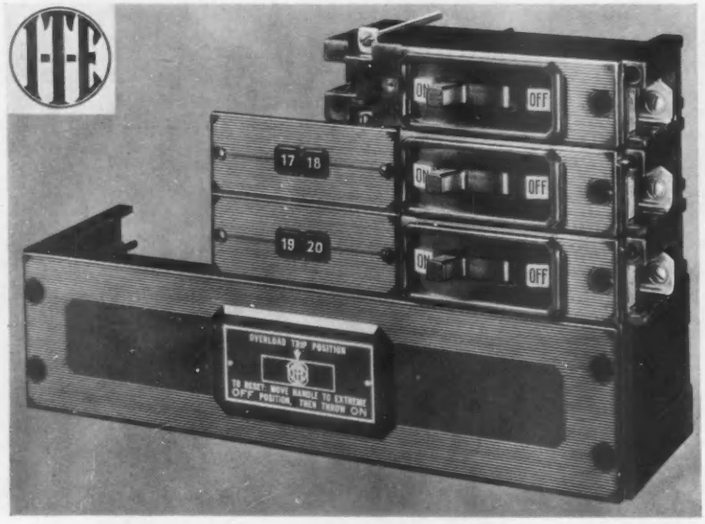
Our nearest representative will be glad to send you the thirty-two page catalog No. 1834 shown below describing the complete line of ITELITE circuit breakers.





I-T-E CIRCUIT BREAKER COMPANY

Philadelphia, Pa.



ABOVE: Front view of partial assem bly of panelboard breakers.

TOP: Three pole general purpose mounting circuit breaker, 50 to 100 ampere capacity, 110-600 volts.

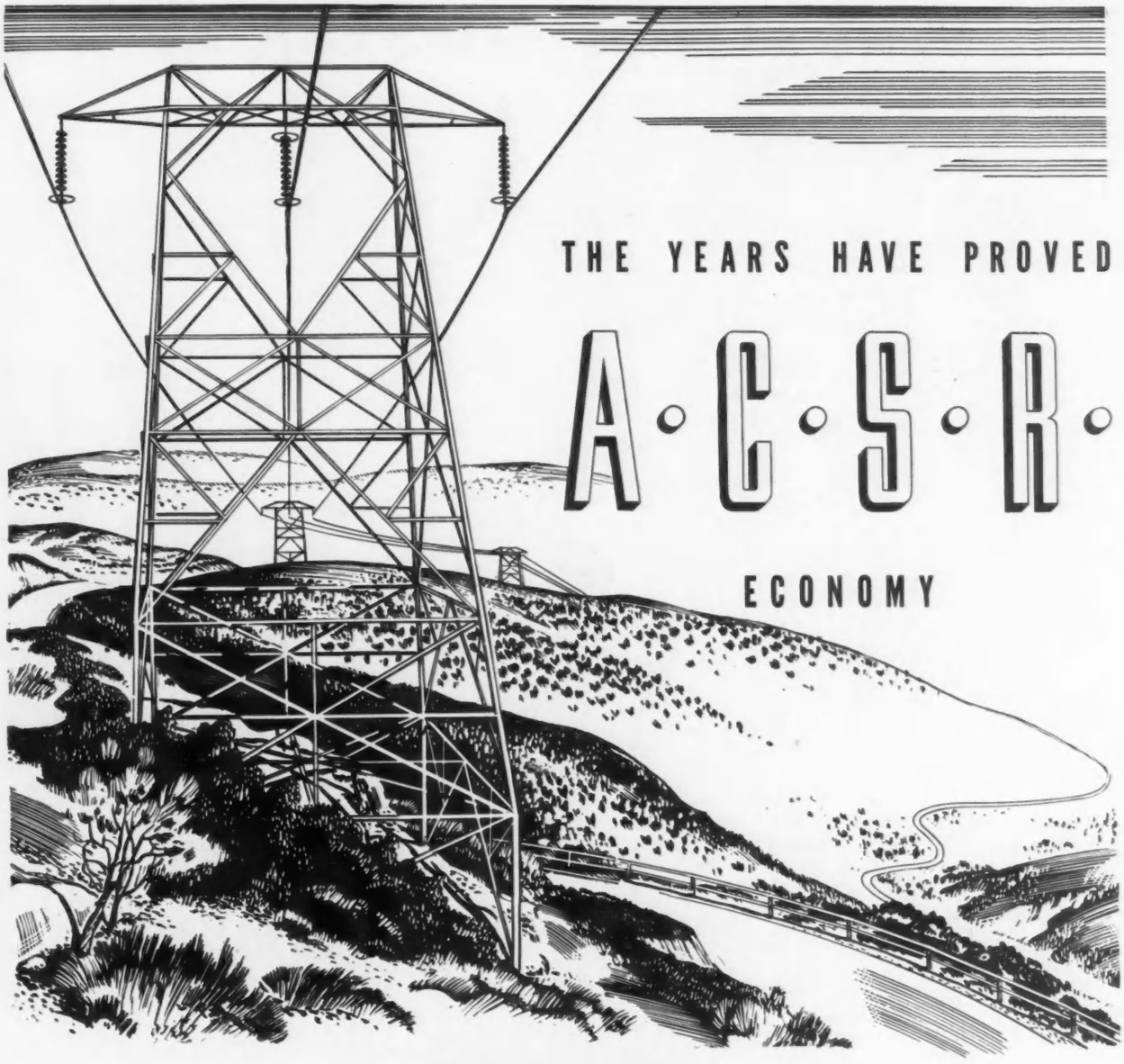
CENTER: ABOVE—Cut-a-way side view showing toggle construction on new ITELITE circuit breaker.

WESTERN REPRESENTATIVES

OLIVER B. LYMAN
74 New Montgomery St., San Francisco

OTTO DEMMERT
106 West 3rd St., Los Angeles

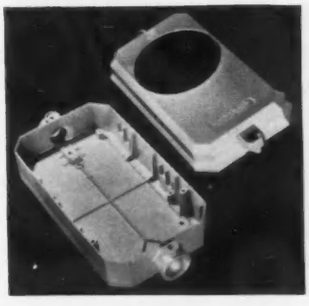
BURTON R. STARE
802 33rd Avenue, Seattle



● Among the many "firsts" credited to the West, is the first A. C. S. R. transmission line to operate at 220,000 volts, built 22 years ago.

The same sound engineering considerations behind that historic project give A. C. S. R. the overwhelming preference for transmission lines in 1935.

The high strength-weight ratio of A. C. S. R. is an all-important fundamental. It affects advantageously the number, design, and location of towers. It provides an extra factor of mechanical safety.



Outside meter boxes of Alcoa Aluminum cannot rust. Aluminum is highly resistant to atmospheric corrosion; needs no paint protection; never discolors adjoining surfaces.

Reliability is enhanced by the behavior of A. C. S. R. when flashovers occur. The arc moves on the aluminum strands, and causes only surface burns. The steel core, which provides from 50 to 60% of the strength, is permanently protected.

Recent installations have demonstrated, too, that A. C. S. R. shows important savings in the cost and the time of stringing.

The co-operation of our experienced engineers is always at your disposal. ALUMINUM COMPANY OF AMERICA, 1832 Gulf Building, Pittsburgh, Pa.

REG. U. S. PAT. OFF.

ALCOA ALUMINUM

IN WESTINGHOUSE METERS

INDOOR OUTDOOR

This bearing is backed by THIRTY-FOUR YEARS of ball-bearing manufacturing experience and operating data. Pioneered in 1901, it is interesting to note that the design of the bearing is still the same.
KILOWATT HOURS
Westinghouse
115 120
2180B

—THE BEARINGS

NEED NO PERIODIC REPLACEMENTS...

Requiring no lubrication, the ball bearings in Westinghouse Watthour Meters once installed can almost be forgotten. Operating records throughout the country reveal that this ball and double jewel bearing has almost unlimited life. Only unnatural conditions can affect it. ◆ This bearing typifies the whole construction of Westinghouse Watthour Meters. Designed not only for initial but also for sustained accuracy, Westinghouse meters assure accurate registration of the energy consumed, with minimum attention and maintenance.

R-57017

SINCE 1888

METERS INSTRUMENTS RELAYS

Westinghouse

Type K flush-mounting Instruments for miniature control boards. Two miniature lamps like the one shown make the type K scale easy to read.

Type H projection-mounting Instruments for large switchboards.

MODERN INSTRUMENTS for MODERN SWITCHBOARDS

TYPES H AND K INSTRUMENTS INCLUDE . . .

- Ammeters
- Milliammeters
- Voltmeters
- Wattmeters
- Power Factor Meters
- Frequency Meters
- Radio-Frequency Ammeters
- Rectox Types

●The smart, modern appearance of Westinghouse instruments ideally matches their high quality. Why not give your switchboards this *extra* distinctiveness? Get attractive, artistic instrument design that is backed by these time-proved features:

STURDY MOVEMENTS—Ample overload capacity to withstand severe stresses of short circuits on modern interconnected systems.

EASY TO READ—Long scales, spear-head pointers, and clear-cut scale markings assure easy reading. Dials of Type K instruments, for miniature switchboards, are illuminated by two concealed lamps.

COMPACT DESIGN—Type H projection-mounted instruments measure only 5½″ square by 4⅛″ deep. Outside flange dimensions of Type K flush-mounted instruments are only 4″ wide by 4¼″ high.

PERMANENT ACCURACY—All parts affecting accuracy are of the highest quality, and of designs proved by years of service in Westinghouse switchboard instruments.

Westinghouse

INSTRUMENTS

GET COMPLETE INFORMATION

Westinghouse Electric & Manufacturing Co.
Room 2-N East Pittsburgh, Pa.

Please send me:

Cat. Section 43-305 Type H Switchboard Instruments.

Cat. Section 43-330 Type K Miniature Control Board Instruments.

Name .....

Firm .....

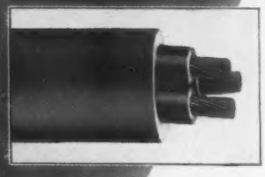
Address .....R 57003

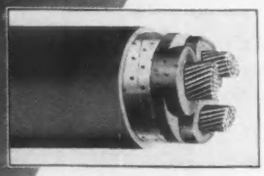
City ..... *State* .....EW 6-35

ROEBLING *Varnished Cambric* CABLES

The Roebling Varnished Cambric Cable shown above is 3-conductor, lead encased. It is merely one of many types of varnished cambric cables made by Roebling.

These Roebling Cables are available in single, two and three-conductor types; for a wide range of voltages; in gauges from No. 14 B. & S. to 2,000,000 circular mils. Braided or leaded. Also with steel, zinc or bronze tape, or round wire steel armor.





Above: Roebling Paper Insulated Cable.

Top: Roebling Rubber Insulated Cable.

OVER 60 OTHER TYPES

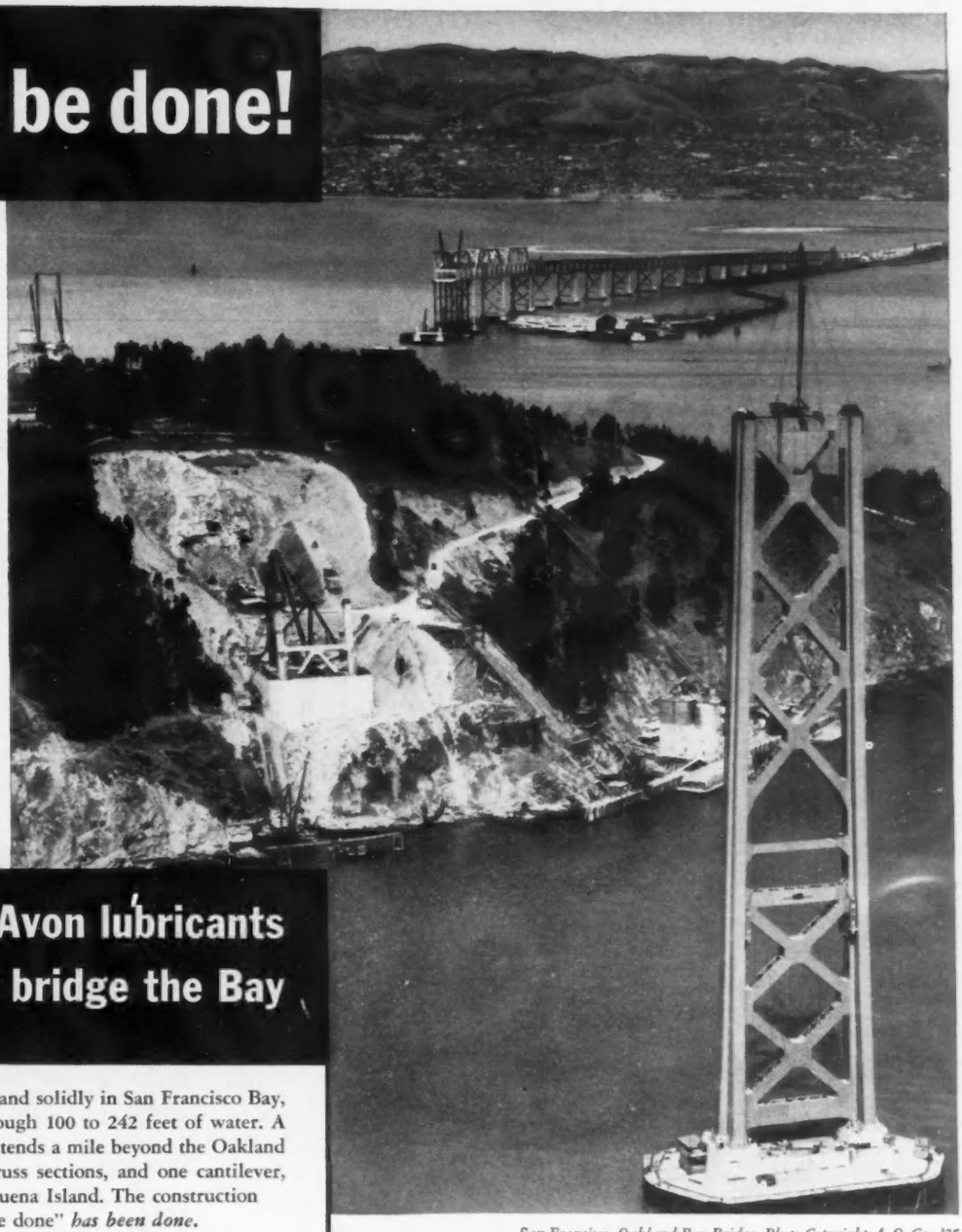
Power Cables: Paper; Cambric; Rubber » Parkway Cable » Tree Wire » Service Cables » Station Cables » Rubber Covered Control Cables » Rubber Covered Wires and Cables: Code; Intermediate; 30% and 40% Performance; 35% and 40% Performite; Plain Rubber 60% Sheath Power Cable and 40% or 60% Sheath Flexible Cords » Slow Burning Wires and Cables » Weatherproof Wires and Cables » Submarine Cables » Portable Cords » And a wide variety of other wires and cables.

JOHN A. ROEBLING'S SONS CO. OF CALIFORNIA

San Francisco Los Angeles Seattle Portland

ONLY A FINE PRODUCT MAY BEAR THE NAME ROEBLING JAR

It CAN be done!



San Francisco - Oakland Bay Bridge. Photo Copyright A. O. Co., '35

Cycol and Avon lubricants help bridge the Bay

High towers already stand solidly in San Francisco Bay, plumbing bedrock through 100 to 242 feet of water. A double deck of steel extends a mile beyond the Oakland fill; only four more truss sections, and one cantilever, will reach Yerba Buena Island. The construction that "can't be done" *has been done.*

A BRIDGE to join Oakland and San Francisco? "It can't be done," smart skeptics said. The distance is too great, the tides too swift, the Bay too deep — and its bottom is mud and silt, unsuitable for anchoring piers.

But the bridge is already half complete. The foundations, the piers — the "impossibles" —are finished. It *can* be done.

Seemingly impossible problems sometimes test the mettle of lubrication. But we've found they, too, "can be done." The nomenclature of Cycol and Avon lubricants, the products used on the Bay Bridge, is extensive —"there is one for every industrial use." And when a *new* problem presents itself, our engineers develop a *new* lubricant, a lubricant that *can* do the job.

If you have a problem in lubrication, turn it over to us. Your post-card or phone call will bring an engineer—and, with him, the wide resources of our laboratories and refineries.

ASSOCIATED OIL COMPANY

Standard Clark-Sundh "Across-the-Line" type starter

Clark-Sundh traffic signal control board built for the City of Boston, Massachusetts

That Your Convention May Be A Profitable One!

The cartoonist took a lot of liberty with the appearance of our Pacific Coast representatives, altering them to suit the convenience of his non-facile pen.

But that doesn't alter the fact that all three—Oliver B. Lyman of San Francisco, J. G. Corrin of Los Angeles and Burton R. Stare of Seattle—will be on hand to greet you; will do all they can (and that's a lot) to make your visit to the printed Coast Convention of Electrical Associations a pleasant and profitable one.

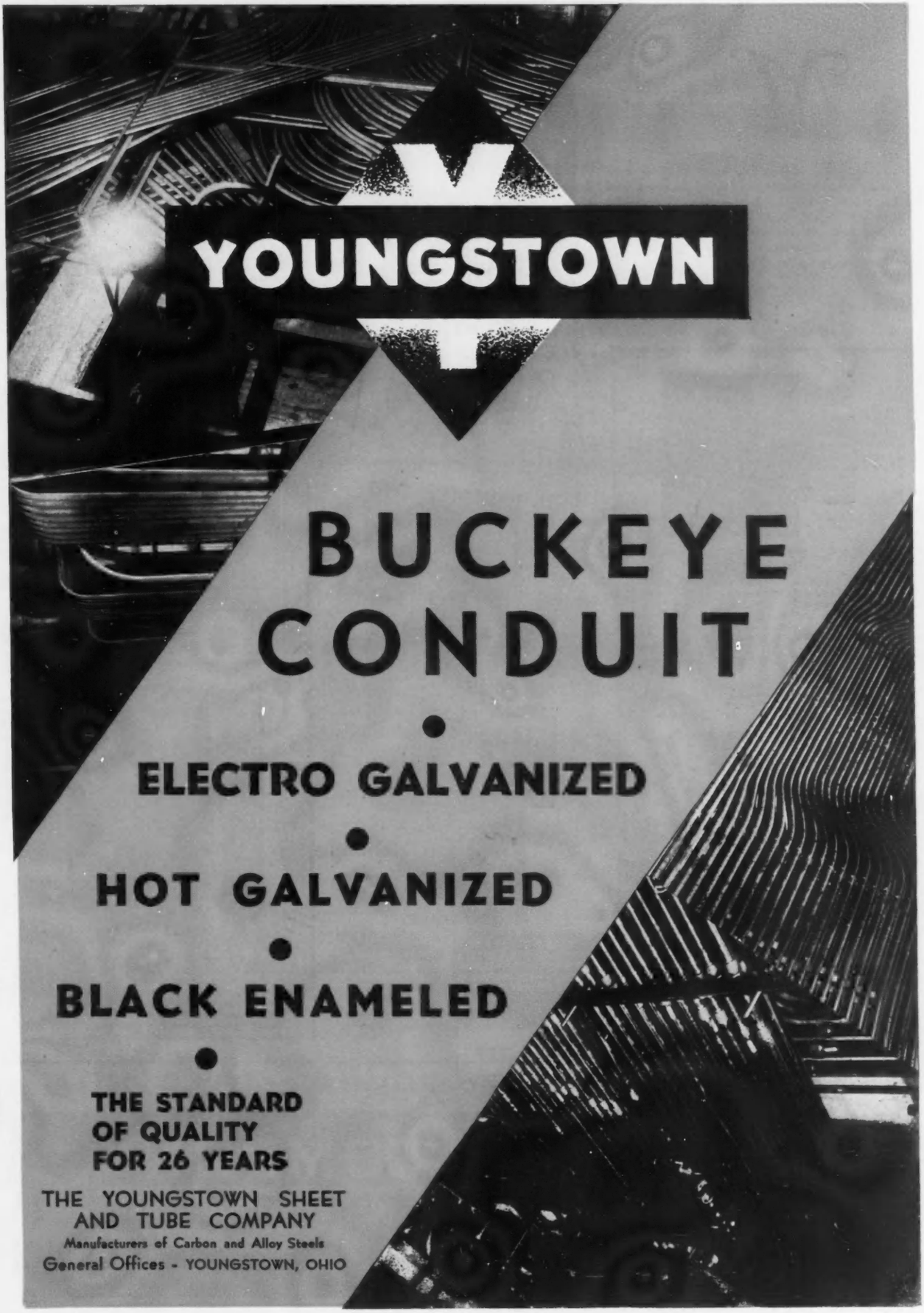
You'll find these men ready to give you the latest word on the last word in manual and automatic electrical control. Back of them stands the joint experience and engineering knowledge of two important factors in the electrical control industry, the Sundh Electric Company combined with The Clark Controller Company.

Make our headquarters yours. Let the "Clark-Sundh Trio" entertain you, not with song, but with facts and figures that point the way to greater efficiency and profit in the control of electric motors.

THE CLARK CONTROLLER CO.

Clark-Sundh Electrical Control

Office and Factory: ***Cleveland, Ohio***

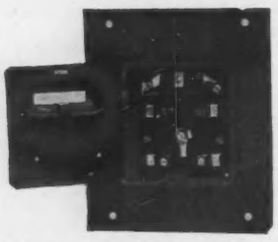

YOUNGSTOWN
BUCKEYE
CONDUIT
•
ELECTRO GALVANIZED
•
HOT GALVANIZED
•
BLACK ENAMELED
•
THE STANDARD
OF QUALITY
FOR 26 YEARS
THE YOUNGSTOWN SHEET
AND TUBE COMPANY
Manufacturers of Carbon and Alloy Steels
General Offices - YOUNGSTOWN, OHIO

Modern Equipment

Keeping pace with utility load building programs, modern Square D Safety Switches and Panels qualify for the safe control of domestic electrical requirements. Because utility sales activity has concentrated on domestic loads, Square D has centered its attention on improved products capable of satisfactorily and conveniently handling not only today's, but tomorrow's, anticipated requirements, both indoors and out.

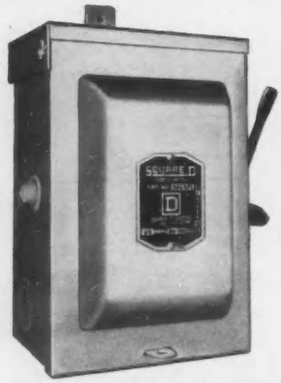
FOR CONTROL OF NEW DOMESTIC LOADS BOTH INDOORS AND OUTDOORS

Illustrated below are five items included in the complete line of Square D equipment. Convenience and economy are perhaps the outstanding features to the consumer. Most impressive to the contractor will be the ease of wiring and installation, as well as the variety of installation types offered. To dealers, contractors and consumers the Square D name will assure the highest standards in design, materials and workmanship.



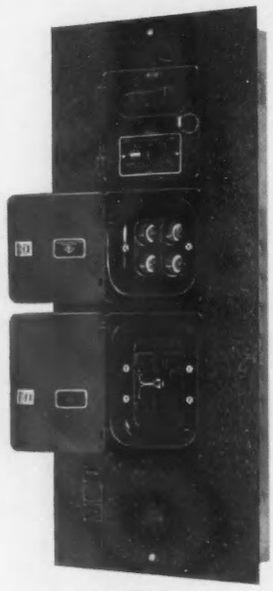
SERVICE ENTRANCE SWITCH
(ROTOR DISC TYPE)

A new design, flush mounting, high quality service entrance switch. Front operated, heavy-duty rotor disc type, main disconnect switch. Enclosed in shallow cabinets, eliminating necessity of furring walls.



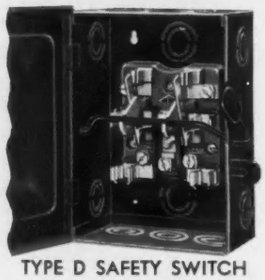
OUTDOOR SAFETY SWITCH

Weatherproof type for every outdoor lighting service. No protective enclosure required. Removable hinged cover for easy wiring. Wide overlapping joints excluding moisture. Heavy duty galvanized steel box, aluminum painted.



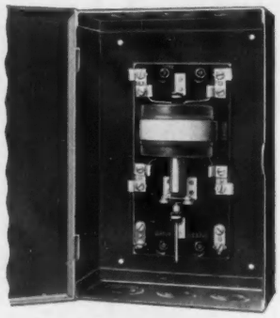
RESIDENCE PANEL

The famous All-N-One cabinet. Includes wide, narrow, flush or surface mounting types. With or without bell and/or furnace transformer space; also dead front fuse break for control of electric range and water heater circuits. Provision for Despard or Bryant wiring devices. Also main line rotor disc type disconnect switch. New meter sequence: meter-switch-fuse.



TYPE D SAFETY SWITCH

A competitively priced service entrance safety switch. Rugged, sturdy construction. For surface or semi-flush mounting —side operated—Slow make, slow break. Full range in sizes and capacities for domestic requirements. Underwriters approved.



LOAD LIMITER
(ENCLOSED TYPE)

For use where utility offers advantageous power rate provided maximum demand is kept within a certain limit. Device operates by interrupting one circuit when load on another circuit exceeds a predetermined amount. Automatically closes first circuit when second circuit drops below this operating point. Noiseless operation.

Call in A SQUARE MAN

SQUARE D COMPANY
ELECTRICAL EQUIPMENT
INC.
LOS ANGELES · SAN FRANCISCO · DENVER · HOUSTON
SQUARE D COMPANY · DETROIT · MILWAUKEE

What IS the Life of WEATHERPROOF WIRE* ?

PEERLESS
WEATHERPROOF WIRE

alone has a braid enclosed covering of unspun cotton. The fine fibre structure of this unspun cotton holds the pure air blown asphalt saturant against all assaults of weathering . . . What double or triple braided wire could compare with the Peerless performance pictured here?

Product of the Los Angeles Plant of

GENERAL CABLE CORPORATION

30 OTIS STREET — SAN FRANCISCO
3600 E. OLYMPIC BLVD.—LOS ANGELES
1901 SMITH TOWER — SEATTLE

**For Peerless, the colored yarn annual marker makes the record accurate beyond question.*

13 YEARS **PEERLESS CASE No. 1.** Wire was taken from a line after 13 years of service. Note the outer braid is still intact.

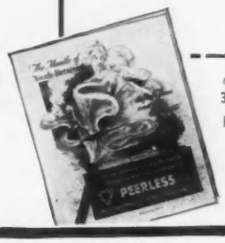
15 YEARS **PEERLESS CASE No. 2.** Taken from a location where salt air and climatic conditions are severe. The outer braid is still in good condition.

18 YEARS **PEERLESS CASE No. 3.** Also taken from a location having severe climatic conditions. Despite the fact that the braid has disappeared, the covering of unspun cotton remained intact, proof of the long life of Peerless.

18 YEARS **PEERLESS CASE No. 4.** Wind and weather destroyed the braid, but again the unspun cotton has held the saturant uniformly in place. No migration of saturant, no festooning of covering.

21 YEARS **PEERLESS CASE No. 5.** This wire was in service 19 years, followed by two years of test weathering—a total of 21 years in operation. The unspun cotton covering is still in perfect condition.

24 YEARS **PEERLESS CASE No. 6.** After 24 years of life, the unspun cotton covering is just starting to disintegrate, but still shows no festoons.



GENERAL CABLE CORPORATION
3600 E. Olympic Blvd., Los Angeles
Please send me your bulletin on Peerless Weatherproof Wire.

Name & Address _____

SANGAMO

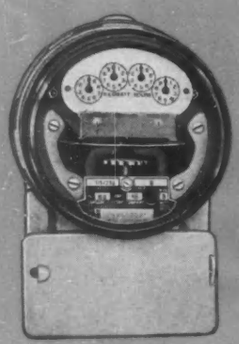
MODERN METERS AND

METERS

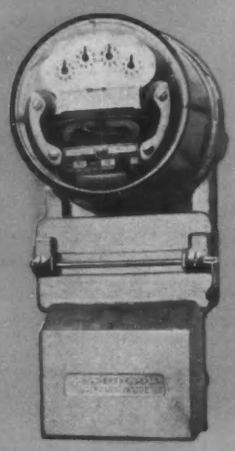
Type HFA
House Type

Type HFS
Socket
Mounting

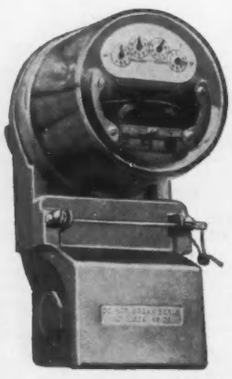
Sangamo watthour meters are modern meters. Retaining proven fundamental characteristics of design, improvements have been made in overload performance, temperature compensation, bearing construction and lubrication, as well as other important details. Outdoor meters of all approved types, polyphase meters, two rate meters, demand meters, prepayment meters and various special meters are all in the complete Sangamo line.



Type HFB
with Safety
Disconnects

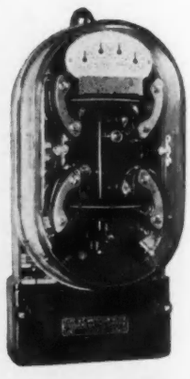


Type HFB
and
Pull Box



Type HFA
and Pull Box

Type HFC
with Enclosure



Type HC
Polyphase

SANGAMO ELEC

Springfield

TIME-SWITCHES

Accurate Dependable

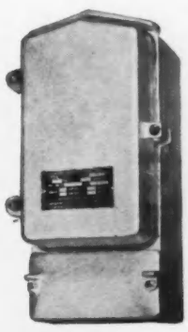
TIME-SWITCHES

With the modern meter for the modern load, came the necessary development of dependable time switches. Sangamo time switches have a background of thirty-five years of precision manufacture. The complete line includes synchronous motor, electrically wound, astronomic dial and various other types for both indoor and outdoor installation, as well as combined meters and time switches. . . . . .

Model F
Socket Type

Form K
Synchronous
Motor

Combined
Meter, Time-Switch
and Two-Rate Register



Type TCO
Outdoor
Time-Switch

Form VSO
Outdoor
Time-Switch

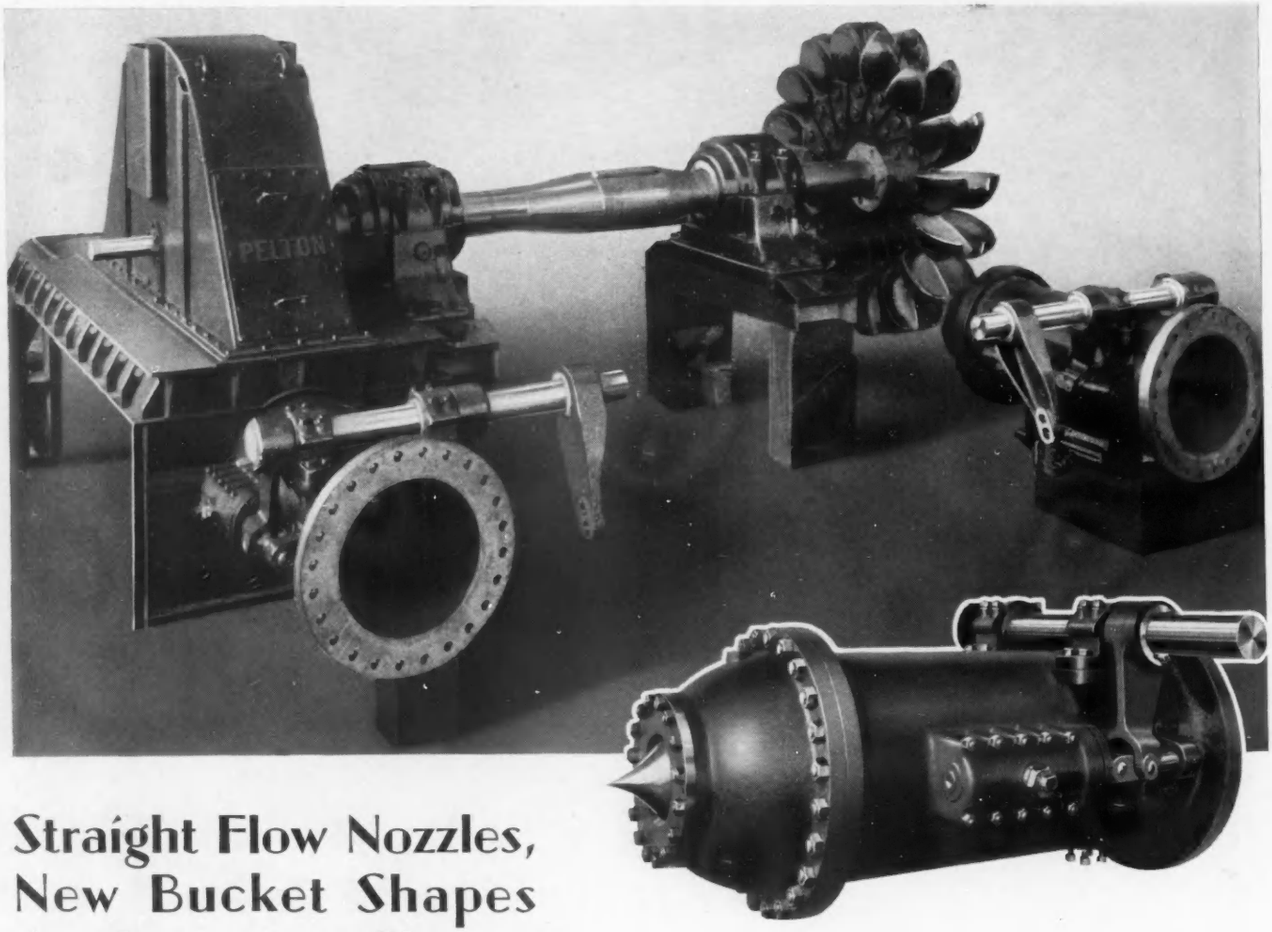
Type TC
with Astronomic
Dial

Form VW
Electrically
Wound

CTRIC COMPANY

ld Illinois

Modern Design In Impulse Wheels



Straight Flow Nozzles, New Bucket Shapes Are Important Changes

A number of important changes in impulse wheel design have been effected within the past few years which have proved of far-reaching economical value. Improvement in nozzle and bucket construction has been most outstanding, these features being incorporated in the new 3,500 Hp. house service units for Boulder Dam and shown in the illustration.

Fortunately the changes are of such character that they may be easily and inexpensively applied to practically any existing impulse turbine, bringing to these older installations the desirable operating characteristics of modern design.

Pelton engineers will gladly assist in the analysis of any plant conditions looking to improvement in efficiency, increased output and reduction in operating cost.

THE PELTON WATER WHEEL COMPANY

HYDRAULIC ENGINEERS

120 Broadway	2929 Nineteenth St.	Paschall Station
NEW YORK	SAN FRANCISCO	PHILADELPHIA

Pacific Coast Representatives for BALDWIN-SOUTHWARK CORP., DE LA VERGNE ENGINE CO., CRAMP BRASS & IRON FOUNDRIES CO. and LARNER ENGINEERING CO., of Philadelphia, Pa.; WOODWARD GOVERNOR CO., of Rockford, Ill.

PELTON

OUTSIDE of the United States, buried cables are as common as conduit lines are here. Notwithstanding this, the trend is definitely toward the former. **The American Steel & Wire Company** has blazed the trail with its installation of 44KV "parkway" cable and the hundreds of installations of non-leaded submarine cable. For the "perfect" non metallic sheathed buried cable ask for a sample of our **Triple "L"**. If unusual mechanical protection is required, specify **"Armorlokt"** or standard metallic finishes.

AMERICAN STEEL & WIRE COMPANY

United States Steel Corporation Subsidiary

Pacific Coast Distributors

COLUMBIA STEEL COMPANY

SAN FRANCISCO LOS ANGELES PORTLAND SEATTLE

NRA U.S. CODE

ALONG WITH THESE PRODUCTS

Three departments of the Kearney organization which are vital factors in the origination and creation of Kearney Products are—(Top) Engineering and Drafting; (Center) Development; (Bottom) Testing.

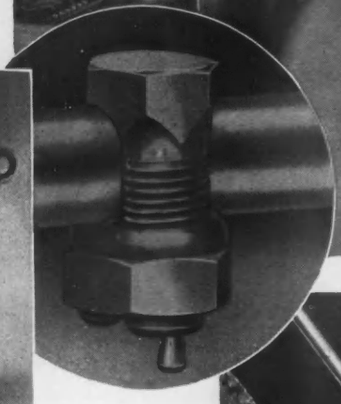
KEARNEY PRODUCTS

Solderless Con-nec-tites; Trip Out Fuse Switches; Trip-Saver Fuse Switches; One and Two-Insulator Fuse and Disconnect Switches; Porcelain Housed Tripomatic Fuse Cutouts, Double Duty Cutouts; Pole Top and Quick-Break Gang Operated Switches; Porcelain Housed Disconnect Switch, Dual Trip Out Switches; Screw Anchors, Expansion Anchors; Guy Wire Clips and Strand Bands; Economy Cable Clamps; Dead-End Service Clamps; Fuses, Fuse Link Boxes, Fuse Pullers; Hite-meters; "J" Hooks; Conduit Straps; Pole Stubbing Seats; ABC Sleeves; Cable Ring Saddles; Sleeve Twisters; Underground Boxes; Ground Wire Clips; Ground Rod Con-nec-tites; Grounding Cable; Secondary Fuse Holders; Telephone Drop Wire Ties; Hi-Line Tools and Accessories; Con-nec-tap Clamps; Grounding Sets; Mastorenches; T-Con-nec-tites; Cable Sheath Con-nec-tites; Full-Vu Guy Guards.

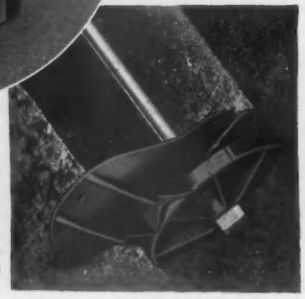
KEARNEY ENGINEERS PRODUCE—

THERE'S a definite reason why Kearney Products have that something that other products lack . . . Just check the man-power of the Kearney Engineering Staff, alone, and you'll understand why this organization leads the way in originating and improving products such as shown on this page . . . Check further, and you'll learn that thirty men in the Engineering Department devote their undivided effort and attention to the study of your needs and to the development of equipment which will do a job — simplify your distribution problems and reduce your maintenance costs.

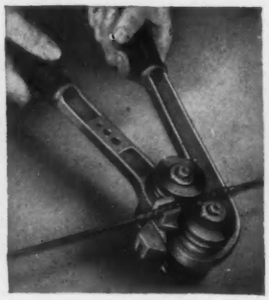
Kearney now supplies a complete line of distribution hook switches in 200 and 400 ampere sizes, with voltage ratings—7.5, 15, 23 and 34.5 Kv. Dimensions conform to N. E. M. A. requirements.



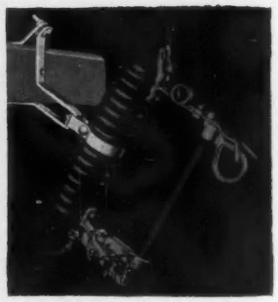
Kearney Con-nec-tites offer maximum conductivity, strength and dependability. The illustration above shows the latest development in Con-nec-tites featuring the patented full-round washer and the new design of the nut retainer.



Kearney (Two-Way) Hi-Tension 4-in-1 Expansion Anchor, when installed, has 63% of its area in undisturbed earth.



ABC Sleeves, installed with ABC Machines, are used by the thousands to make stronger, low resistant joints.



Kearney Trip Out Switches incorporate point pressure contacts to give superior performance in actual operation.

JAMES R. KEARNEY CORPORATION ST. LOUIS, MO

The Mark of Quality Products

JAMES R. KEARNEY

DESIGNERS and MANUFACTURERS OVERHEAD and UNDERGROUND **UTILITY EQUIPMENT**

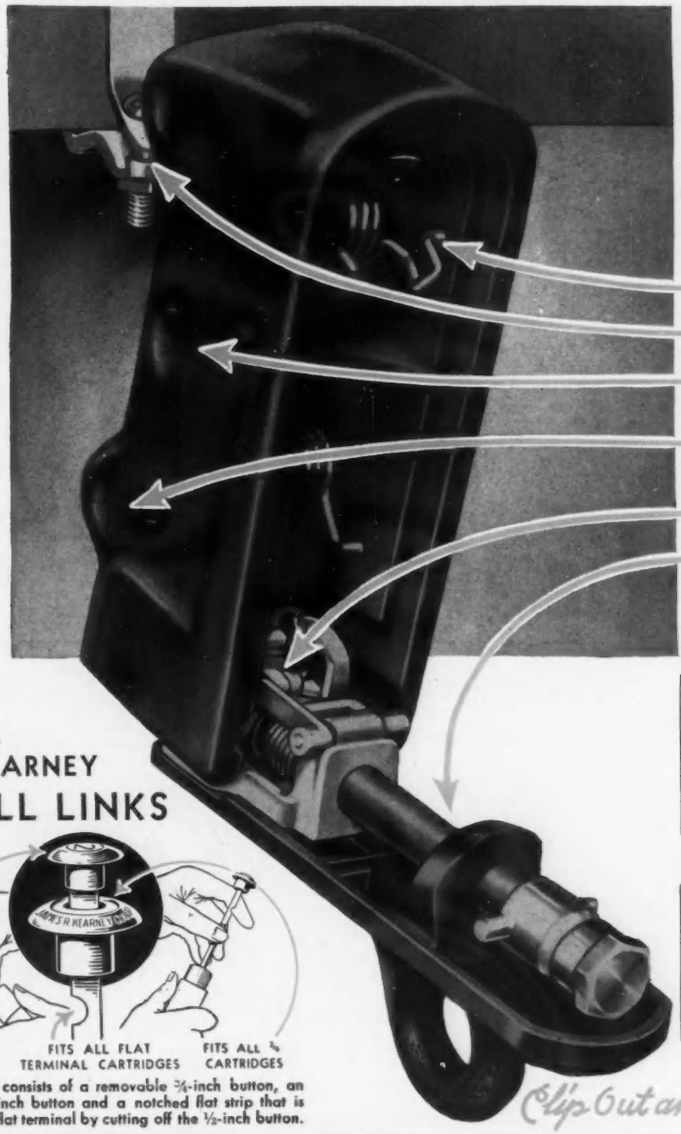
FACTORY REPRESENTATIVES

SAN FRANCISCO — MAYDWELL & HARTZELL INCORPORATED — LOS ANGELES

another **ACHIEVEMENT**

The New and Improved

TRIPOMATIC FUSE CUTOUT



For first-hand information on the finest box we've ever built, we urge you to get hold of a new Kearney TRIPOMATIC... test it, judge its superior features, then... match it against anything on the market today for performance. The coupon below makes it easy.

7 FEATURES

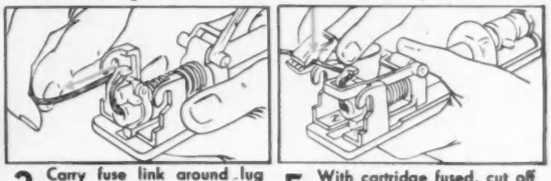
1. NO CEMENT and NO PLATED METAL PARTS are used in this box.
2. Upper contact, of the Kearney Point Pressure Type, is combined with the latch.
3. All-round, clamp-type hanger supports the crossarm—swivel joint permits facing box towards lineman.
4. Hanger is bolted to porcelain. A specially developed bronze washer automatically compensates expansion differences.
5. Lead connections are made by clamp-type terminals set in apertures at the back of the box and are separated from the cartridge chamber proper.
6. Lower fuse terminal is a pressure type contact which eliminates the use of wing screws.
7. Bakelite door trips out—forms a dead hinge . . . The door is provided with a pull-ring with ample opening.

FIVE EASY FUSING OPERATIONS

1 The fuse link is threaded through the tube—then you merely screw the cap on in the usual manner.

2 Next, you pull the link snugly over the lug.

4 Compress spring and drop the arm into place.



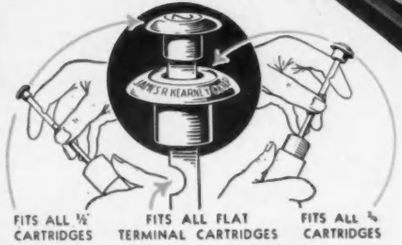
3 Carry fuse link around lug and snub in V-groove.

5 With cartridge fused, cut off the excess fuse cable.

Use—

KEARNEY

FITALL LINKS



FITS ALL ½ CARTRIDGES | FITS ALL FLAT TERMINAL CARTRIDGES | FITS ALL ¼ CARTRIDGES

The terminal consists of a removable ¾-inch button, an attached ½-inch button and a notched flat strip that is made into a flat terminal by cutting off the ½-inch button.

Clip Out and Mail

CORPORATION

4224-42 CLAYTON AVE., ST. LOUIS, MO.

FACTORIES AT ST. LOUIS, MO. AND TORONTO, CANADA

NAME_____

FIRM_____

ADDRESS_____

SEND SAMPLE ☐ SEND INFORMATION ☐

☐ TRIPOMATIC ☐ ANCHOR ☐ TRIP OUT

☐ ABC MACHINE ☐ DEAD-END CLAMP

FACTORY REPRESENTATIVES

SAN FRANCISCO — MAYDWELL & HARTZELL INCORPORATED — LOS ANGELES

WESTON *dependability* in Modern Settings

The present trend toward rectangular instruments emphasizes Weston's leadership to a marked degree. Rectangulars were introduced by Weston over 10 years ago . . . and are today available in all standard sizes including the 3″ line.

Whether rectangulars are to be used because of their greater utility, or for purposes of design . . . or whether the need is for round or fan-shaped instruments . . . each requirement can be filled from the complete Weston line. *Weston dependability is available in any shape or form* . . . Weston Electrical Instrument Corp., 577 Frelinghuysen Avenue, Newark, N. J.

WESTON *Instruments*

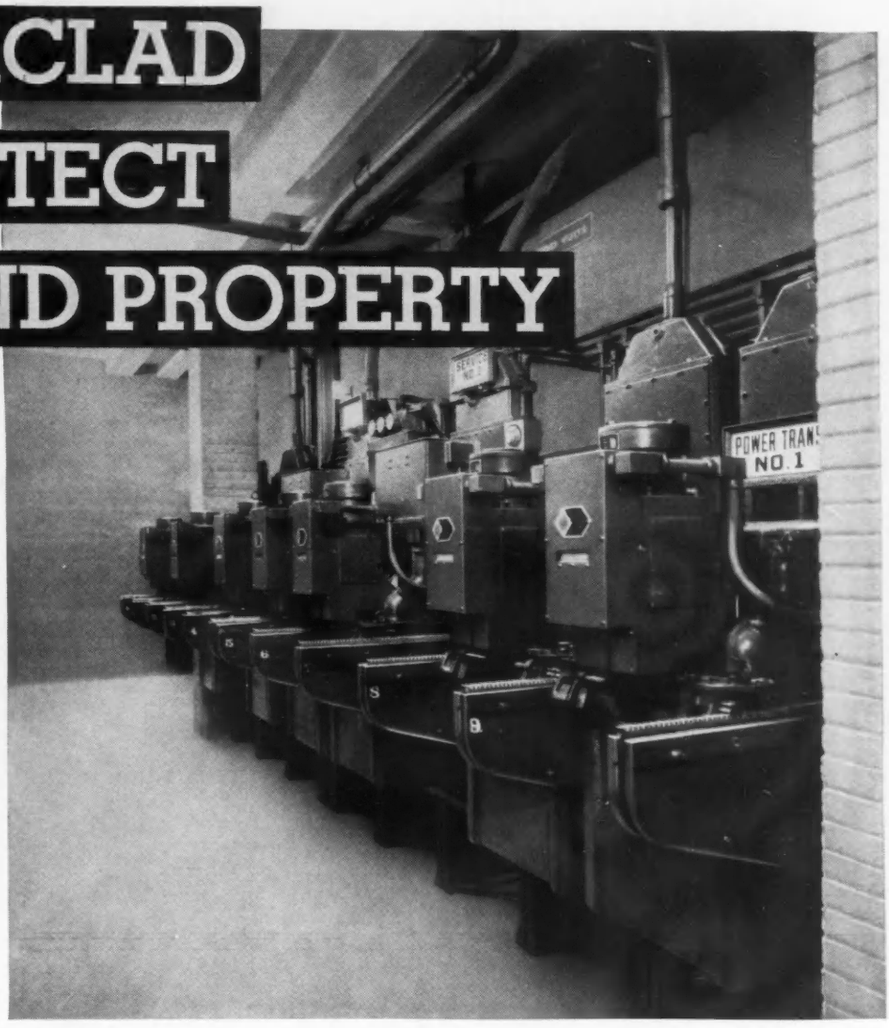
PACIFIC COAST REPRESENTATIVES

Eicher & Bratt,
263 Colman Bldg.
Seattle, Wash.

C. F. Henderson,
420 Market St.
San Francisco, Calif.

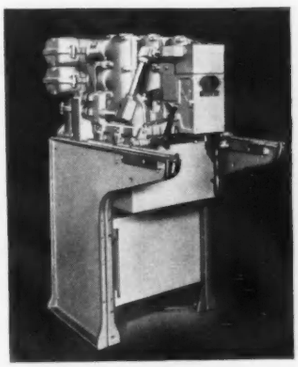
Electrical Engr. Sales Co.
Subway Terminal Bldg.
Los Angeles, Calif.

ARMORCLAD TO PROTECT LIFE AND PROPERTY



ALLIS-CHALMERS
WESTERN SALES OFFICES

Denver, Colo.
Los Angeles, Calif.
Phoenix, Ariz.
Portland, Ore.
Salt Lake City, Utah
San Francisco, Calif.
Seattle, Wash.



INTRODUCED by Allis-Chalmers into this country only a few years ago, the metal-clad type of switchgear has become the recognized standard for the ultimate in safety and reliability in switching operations ... Allis-Chalmers Reyrolle Armorclad switchgear reduces installation and maintenance expense, provides safety to operators, and insures continuity of service. It incorporates the latest and most modern features of research, design and construction.

Armorclad Switchgear combines into one metal encased, compound filled, factory-built and assembled unit, all of the necessary apparatus to make a complete three phase oil circuit breaker installation. Its safe operation, compactness and reliability have appealed to builders of power plants, substations, industrial plants and office buildings ... and being of unit construction, completely assembled, it is easy to install. For bulletin write to Allis-Chalmers Mfg. Co., Milwaukee, Wis.

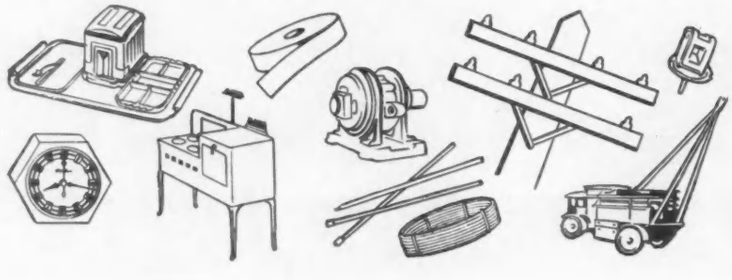
ALLIS-CHALMERS

REYROLLE SWITCHGEAR

to Three big men

of the Electrical Industry

Graybar's nationwide supply service is geared to meet the special needs of *every* branch of the electrical industry. *To the utility buyer,* Graybar makes available every item from the top of the pole to the bottom of the hole (as well as appliances for re-sale). *To the dealer,* Graybar brings a complete line of quality household appliances, backed by the Graybar tag. *To the electrical contractor,* Graybar provides a 60,000 item source of dependable wiring supplies. *To all three,* Graybar brings a long experience, convenient location, and a 66 year *quality* reputation.



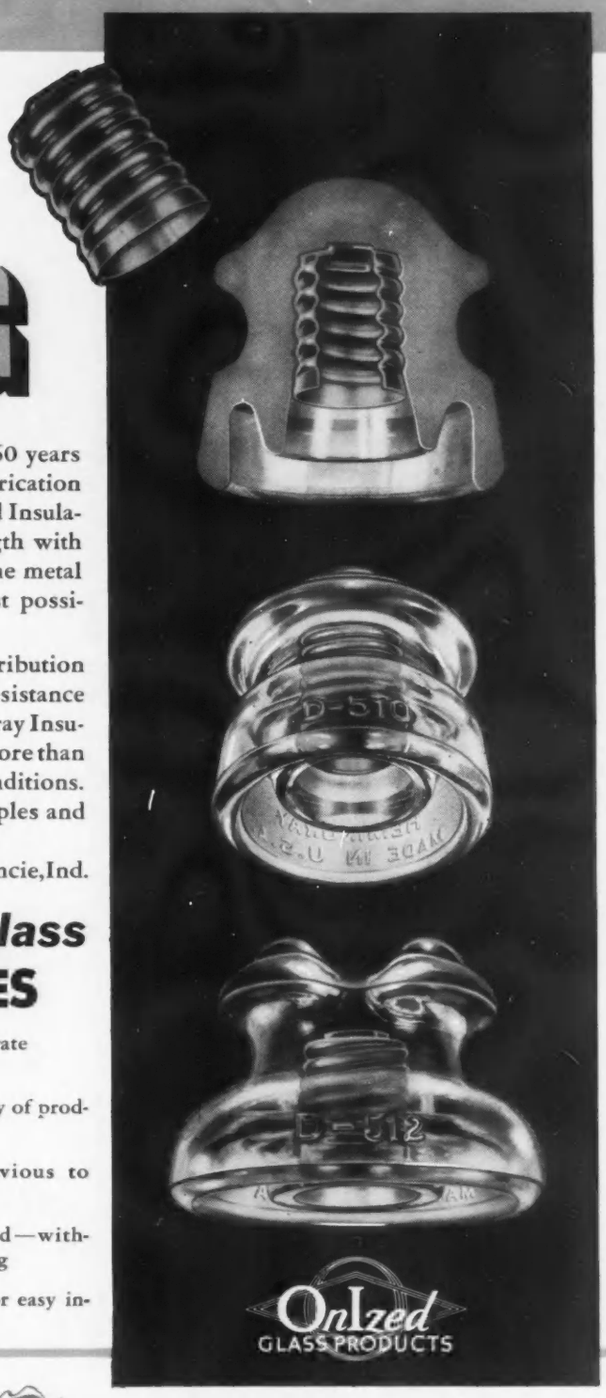
GraybaR

OFFICES IN 77 PRINCIPAL CITIES

EXECUTIVE OFFICES: GRAYBAR BLDG., N.Y.

NOW Hemingray advantages include

BRASS BUSHING



● Hemingray's 40 years of insulator experience plus 60 years of Owens-Illinois experience in all types of glass fabrication culminates in the announcement of the new Brass Bushed Insulator. Brass Bushing affords greater mechanical strength with more economy and dependability than ever before. The metal pin hole provides uniformity and is protection against possible damage from pin expansion.

The three principal insulator requisites for efficient distribution service—dielectric strength, mechanical strength and resistance to heat shock are all built into the new line of Hemingray Insulators with more than ample reserve. This is proven by more than 18,000 tests of all types of insulators under varying conditions. For further details on this new insulator, send for samples and descriptive folder.

Owens-Illinois Glass Company, Hemingray Division, Muncie, Ind.

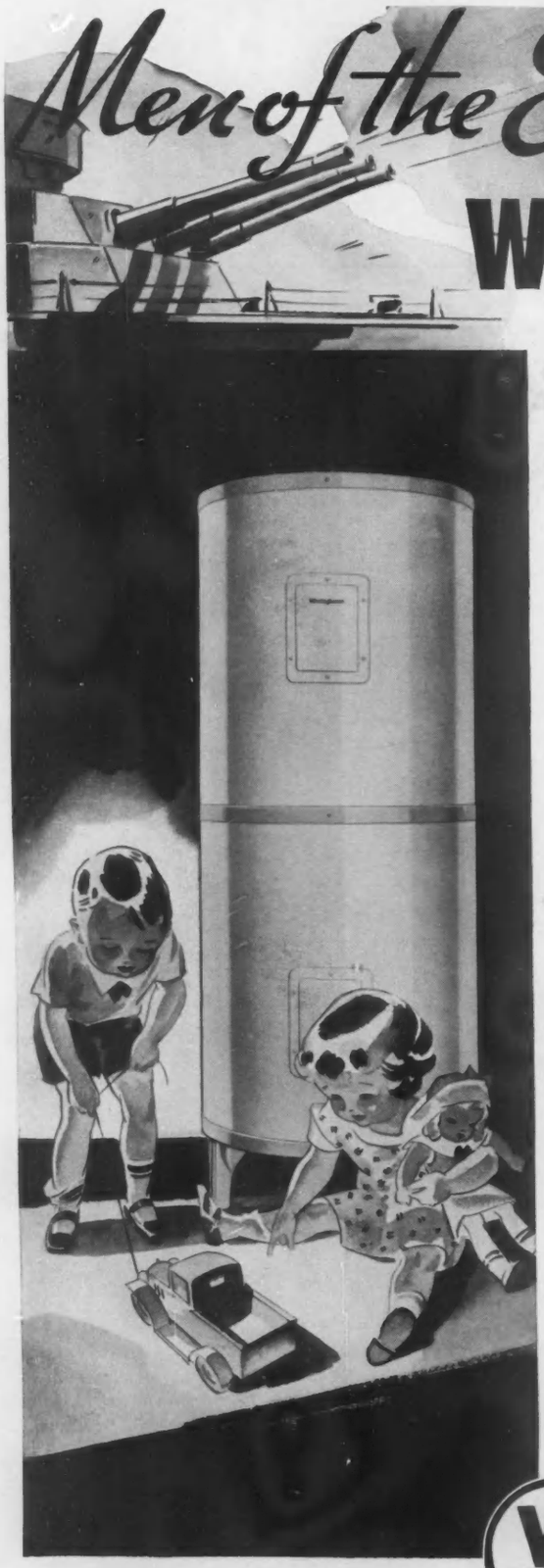
Study these Hemingray glass INSULATOR FEATURES

1. Brass Bushed Smooth threads for insulator pin
2. Greater mechanical strength
3. Sustained high dielectric strength
4. Unaffected by sudden temperature changes
5. Withstand maximum insulator pin expansion
6. Never age or deteriorate
7. Controlled uniformity of product
8. All surfaces impervious to moisture
9. Tougher—improved—withstand rough handling
10. Clear and flawless for easy inspection

HEMINGRAY Glass INSULATORS

Men of the Electrical West

We salute you!



All honor to the industry's western leaders, who are showing what private initiative can provide in electrical convenience for America's homes.

● To help you, we offer lower cost ranges and water heaters of the highest quality; lower costs so that you can reach wider income groups . . . highest quality so that these efficient load-builders will give years of service, *with lasting service economy*.

The "White Swan" automatic electric range announced recently to sell at $79.50 retail, is a notable contribution to these ends. Now the A-64, a range of the same type but with *four* surface units and a spacious utility drawer, provides more load-building opportunities. The dependable line of Westinghouse Automatic Electric Water Heaters likewise marks a new milestone toward an all-electrified West. Westinghouse also offers you new year-round selling plans and practical helps of every description. For them, address Westinghouse Electric & Mfg. Co., Merchandising Division, Mansfield, Ohio.

A-64 AUTOMATIC ELECTRIC RANGE

A new range with 36-inch high, acid-resisting platform to conform to modern all-electric kitchen standards. Full-size oven. Four surface units. Spacious roller-bearing utility drawer.

W WESTINGHOUSE ELECTRIC

Westinghouse *Helps for Load-Building*

IT'S ONLY THE BEGINNING

New General Electric-La Salle training course will help utilities reap bigger rewards from Better Light-Better Sight Program

THE Better Light-Better Sight program has made remarkable progress to date. Home lighting and commercial lighting programs sponsored by utilities in all parts of the country have helped build good will and more load, have proved a satisfactory answer to rate reductions, and have created a more light-conscious public.

But public opinion can't be changed over night. The Better Light-Better Sight idea is too big to be fully realized in a year or two. The longer this activity is carried on, the greater the ultimate rewards.

General Electric has continued spending more money and man-power in a continuous effort to help utilities develop lighting programs based on the Science of Seeing. For the proper development of these programs, the most important single element is proper training of lighting personnel.

To meet this need, General Electric in conjunction with the world-famed LaSalle Extension University has developed a sales training course in home lighting. This course will be available to utilities shortly. Highlights of the new course are given in the right-hand column.

Watch for further announcements. General Electric Company, Nela Park, Cleveland, Ohio.

GENERAL ELECTRIC

announces

NEW GENERAL ELECTRIC-LA SALLE HOME LIGHTING PERSONNEL TRAINING PROGRAM

Successful home lighting programs can be put over effectively only by trained home lighting advisers and supervisors. To train people properly in this work—to the point where they can really sell home lighting—takes time and money. Unfortunately there is at present a shortage of ready-trained personnel for this work. Hence, there's a definite need for an effective home lighting personnel training program.

How This Program Fills the Need. "Light the home and you light the world" is the basic theme behind this program. For once the seed of good lighting is planted in the home, it blossoms wherever people work or roam —in offices, stores, factories, streets.

General Electric and the utilities together have collected a vast fund of information and experience in home lighting. To pool and organize this experience for sales training purposes demanded the work of specialists. So General Electric called on the leading specialists in the sales training field—the LaSalle Corporation Training Service of LaSalle Extension University. This extension university has trained more than a million men and women all over the world. Its sales training services have been retained by many other large corporations.

For months, LaSalle specialists working with General Electric and utilities have been investigating lighting operations and analyzing plans and methods from coast to coast. Then this material was organized so that the fundamentals of the Science of Seeing and the principles of better lighting would be tied in with the basic principles of salesmanship.

What the Courses Include. Specifically there is a complete training course for supervisors to use in training advisers; another for advisers; and still another for retail sales people, to teach them how to tie-in with the advisers' work.

In addition, General Electric has arranged with LaSalle to supply an individual instruction and consultation service throughout the training period.

What will it cost? The increase in load and in merchandise sales resulting from the increased efficiency of personnel will soon more than absorb the cost of the training. Not once but many times.

More complete details will be announced soon.

A great plant in the West now answers your quest for commercial and industrial units that provide

BETTER LIGHT for BETTER SIGHT

SIGHT-CRAFT UNITS ARE DESIGNED FOR

HIGHER INTENSITIES

Smoot-Holman engineers are attuned to the trend toward higher intensities as the modern requirement for better vision. These concepts of scientifically correct lighting units are made in the West for Western conditions and are rapidly increasing in popularity because of price, efficiency and attractiveness.

SIGHT-CRAFT COMMERCIAL UNITS HIT AN ALL-TIME HIGH IN EYE-APPEAL

. . . new 'VENUS' startling in design and efficiency

Sight - Craft
APOLLO
LUMINAIRE

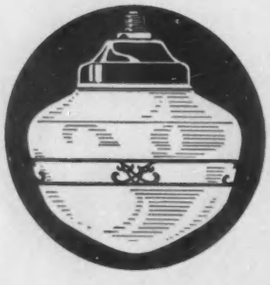
The 'VENUS' is a beautiful luminous bowl that, because of its conservative yet very modern appearance, efficiency and adaptability to any interior is destined to become a popular commercial unit. Through a special louvre effect, the bowl is made luminous, resulting in a pleasing light of high intensity. Its outstanding beauty is attained without sacrifice of efficiency. Of course, the exterior of the 'VENUS' is of the famous VITROLUX ivory everlasting finish—an exclusive SMOOT-HOLMAN process. The 'VENUS' is equally attractive in its price.

4,000 'APOLLO' units sold in 10 months

The incomparable appearance and efficiency of this 'APOLLO' unit make it an outstanding value. Has white interiors and ivory exteriors. Reflectors and hoods are of finest enameling iron on which is fired 3 coats of VITROLUX at 1600° F. Over 4,000 units in use attest to its practical efficiency and beauty.

Sight - Craft
VENUS
LUMINAIRE

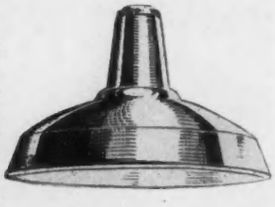
Sight-Craft KITCHEN unit sales show high appeal of COLOR . . . . .



This colorful unit screws into existing lamp sockets—thereby cutting sales resistance to the minimum. Easily demonstrated. Low prices to permit volume sales. Metal holder of superior porcelain enamel—white or colors. Globe: white or decorated to match holder. Uses 150 Watt lamp.

Sight-Craft INDUSTRIAL units of VITROLUX — the everlasting finish . . . . .

Durability and low cost are again evident in these scientifically correct reflector units, thousands of which are proving their worth in Western industries. Especially constructed to withstand severe atmospheric conditions. **Compare** Sight-Craft lighting units and you'll be proud of your WEST.



SMOOT-HOLMAN COMPANY

SAN FRANCISCO — INGLEWOOD, CALIFORNIA — NEW YORK

Seattle—J. Edwin Roberts, 532 First Ave. So.

Here is the *finest*

ELECTRIC RANGE

you can sell!

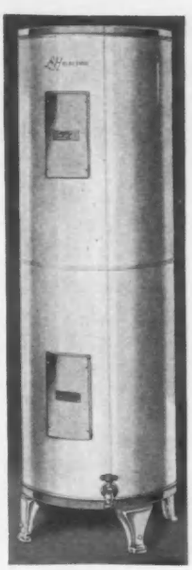
No. 8500—Built-in Time-a-ture provides complete automatic operation combined in one unit—Clock, Temperature Control and Time Control.

Three NEW Color Finishes

NEW smartness, styling, salability. Striking *eye appeal* in Silver, Green and Amber Pearl finishes that arouses admiration . . that makes women buy. New features that are useful . . that produce *sales* response. And *built-in* quality which furthers the L&H Electrics reputation as the 'low service cost' line.

L&H *Air Speed* UNITS

Famous for their quick heat, evenly distributed. Patented, exclusive *air-insulated* design increases efficiency. Induced draft promotes speed. Concentric coils fit small or large utensils with equal *efficiency*. No other type of unit is faster or more economical.



L&H Electric Automatic Storage Type Water Heaters

Nickel chromium unit. Automatic temperature control is *direct* connected .. no relay .. operates on either A.C. or D.C. Tanks are *heavily* insulated with *pure* Rock Wool which does not decompose. Choice of EVER-DUR (copper) or triple galvanized copper bearing steel tanks. Antique Ivory with Brown trim. From 10 gallon to 120 gallon types.

L&H *Advanced*
ELECTRIC RANGES

Get the facts now. Wire or write.

A. J. Lindemann & Hoverson Co.

No. 613 W. Cleveland Ave. Milwaukee, Wis.

NEW YORK CHICAGO SAN FRANCISCO

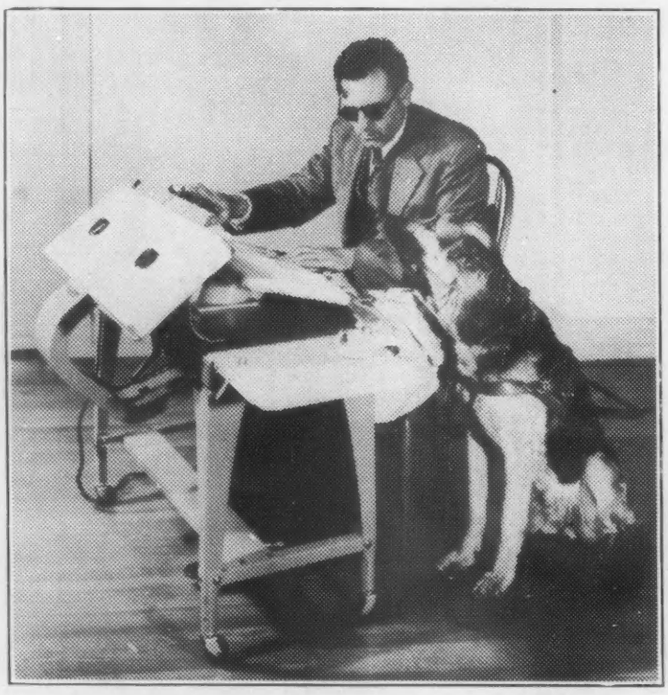
HOME LAUNDRY EQUIPMENT

WASHERS IRONERS

SO SIMPLE . .

A BLIND MAN OPERATES IT!

with perfect ease and comfort!



It's your answer for the IRONER MARKET.

The GENERAL ELECTRIC FLATPLATE IRONER

Simply by demonstrating the operation of the General Electric Flatplate Ironer, R. D. White, blind war veteran, is effectively showing dealers the answer to the real *Ironer Market.*

GENERAL ELECTRIC SUPPLY CORPORATION

Offices and Branches Western Region

SAN FRANCISCO OAKLAND SACRAMENTO LOS ANGELES LONG BEACH SAN DIEGO PHOENIX
EL PASO PORTLAND SPOKANE SEATTLE SALT LAKE DENVER BUTTE

A SERVICE WHICH COSTS YOU

NOTHING

YET WRITES "KWH" AND "MERCHANDISE PROFITS" IN LETTERS OF GOLD

Revenue — from load . . . from merchandise . . . that is the target on which every commercial manager trains the guns of his sales campaigns.

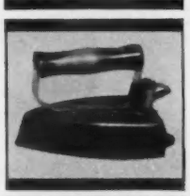
Loads spurt upward when efficient merchandising puts more appliances on the lines.

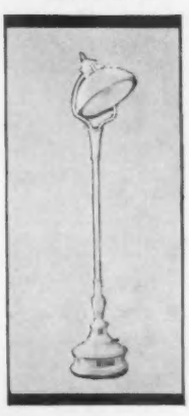
Today, merchandising is no longer the simple trio of price, volume and profit . . . such factors as smart styling, sound engineering and good design . . . are vital to the flow of merchandise.

Ceaselessly . . . tirelessly . . . day in and day out . . . General Electric engineers, stylists and designers are perfecting the merchandise which goes out on your sales floor. Theirs is a service which costs you nothing — yet persuasively . . . silently . . . endlessly . . . moves that merchandise off the floor and on to the power lines.

On this page are shown recent contributions by General Electric in good design, styling and engineering to help you put more load on the line.

See the actual merchar dise, itself, on the showroom floor of the G-E Distributor who serves you.

YESTERDAY	G-E CONTRIBUTIONS	TODAY
	Designed, styled and engineered by G-E. No handle fork — Distinctive motor housing whose interior design muffles sound — Smart streamline styling. Loadbuilding, 40 Kw-hr. annually.	
	Modernistic styling by G-E's Ray Patten — Smart color combination. Quiet operation — only four moving parts. The G-E Flatplate irons and presses effortlessly. Many exclusive G-E developments. Loadbuilding, washer, 50 Kw-hr.; Flatplate, 275 Kw-hr. annually.	
	Note the advanced design of the G-E Bandmaster (right) contrasted with a popular console two years ago. Performance keeps pace with cabinet design, so that today dependable receivers are used more hours per day. Loadbuilding, 150 Kw-hr.—12 tube console.	
	New overlapping fan blades — a 12-inch quiet-type fan delivers a more powerful air stream than a 16-inch conventional-type fan . . . with *extreme quietness.* Loadbuilding, 45 Kw-hr. annually from three fans.	
	Smart styling! The new narrow slip-stream tip makes it easier to watch the ironing. Pick it up—only 3½ pounds weight . . . an energy saver! Loadbuilding, 62 Kw-hr. annually.	
	Study the small, compact design—the smart styling — a line of clocks conceded by the trade to be smartest in the field — priced at one-third the average price four years ago. Loadbuilding, 52½ Kw-hr. (for three clocks, annually).	

YESTERDAY	G-E CONTRIBUTIONS	TODAY
	Consider the S-1 and S-2 bulbs — the result of G-E engineering to give your customers healthful "indoor sunshine." Loadbuilding, 85 Kw-hr. annually from S-1 type bulb.	

GENERAL ELECTRIC

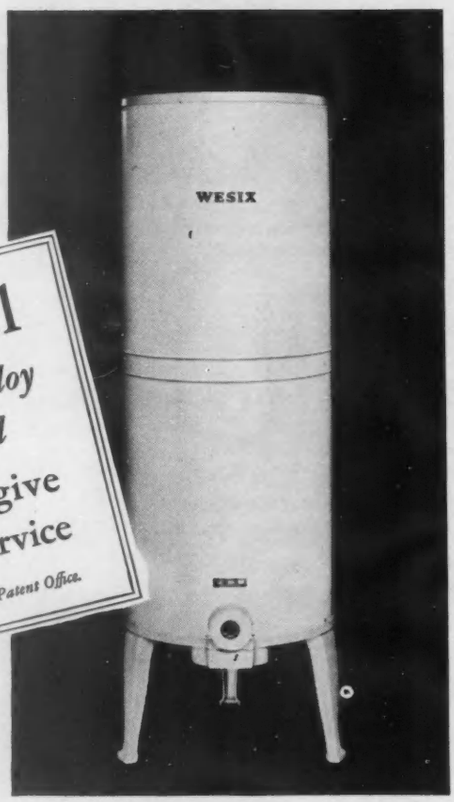
HOME APPLIANCES

MERCHANDISE DEPARTMENT, GENERAL ELECTRIC COMPANY, BRIDGEPORT, CONNECTICUT

Better Value...

for the utility...for the Public

when the tank is Everdur



Everdur Metal

A non-rust copper-silicon alloy with the strength of steel

Ideal for tanks which give long and dependable service

The trade-mark "Everdur" is registered in the U. S. Patent Office.

"WESIX" Automatic Electric Water Heater, manufactured by WESIX, Inc., San Francisco. Cut-away view shows the Everdur tank with which all non-rust WESIX models are equipped. Everdur *cannot* rust!

Water heater tanks of non-rust Everdur offer maximum value, to the utility company and to the consumer as well. Here are the reasons:

They give satisfactory service indefinitely... cost the buyer far less in the long run. They do away with all rust troubles... require far less servicing. They provide steady consumption of electricity... rust cannot interfere with their performance. Their price is unusually attractive... they offer the greatest *value* obtainable. And they are readily available.

Everdur is copper, specially alloyed with silicon to provide the strength and welding properties of steel. Since Everdur is immune to rust, yet possesses these superior physical advantages, leading makers of automatic heaters have standardized on Everdur for rust-proof tanks.

In considering the best interests of your customers ...and of your company as well...we suggest a thoughtful consideration of the advantages of advocating the sale of heaters with Everdur Tanks.

THE AMERICAN BRASS COMPANY

General Offices: Waterbury, Connecticut

Offices and Agencies in Principal Cities

In Canada: ANACONDA AMERICAN BRASS LTD., New Toronto, Ont.

ANACONDA
From mine to consumer

EVERDUR METAL *for* TANKS

10 BIG *Exclusive* FEATURES

mean More Sales More Revenue

Western Type—Patented

WESIX

Automatic Electric Water Heater

All Copper and Brass Fittings

YOU can't buy a better water heater *at any price!* For proof, just look at the exclusive 10 Big Features which mean easier selling for utilities and dealers—features which mean Wesix water heaters *stay sold* because consumers as well as utilities find Wesix gives better hot water service.

So if you're not selling Wesix, stop kidding yourself out of profits and your customers out of perfect automatic water heater joy.

Check these HIDDEN Wesix qualities and then get in touch with us—

1. QUICK RECUPERATION. Full circulation provides a quick accumulation of hot water at the top of the tank without waiting for the entire tank to be heated.

2. BETTER HOT WATER SERVICE. These heaters provide better hot water service than larger tanks equipped with immersion heaters.

3. GOOD LOOKING. Finished in two toned baked enamel. Heating chamber, heater, accelerator tube, and hot water trap hidden between tank and outer shell. No unnecessary frills, but includes all the downright quality that makes Wesix famous for lifetime service.

4. TWO HEATING UNITS. Made of highest quality nickel chromium resistance wire encased in pure copper Duplex Tubing. One a booster, 550 watts to 2500 watts. The other 500 watts to 2000 watts, "get-at-able" without draining the tank or disturbing the plumbing, and repairable at small cost.

5. TWO QUICK BREAK THERMOSTATS. Both Wesix-Kercher Thermostats with chemically pure silver contacts. One arranged to cut out part of the heater when tank is ¼ to ⅓ heated (with long range adjustment). One arranged to cut out when entire tank is heated and placed so that it protects the heater and the tank in the event the tank is allowed o run dry.

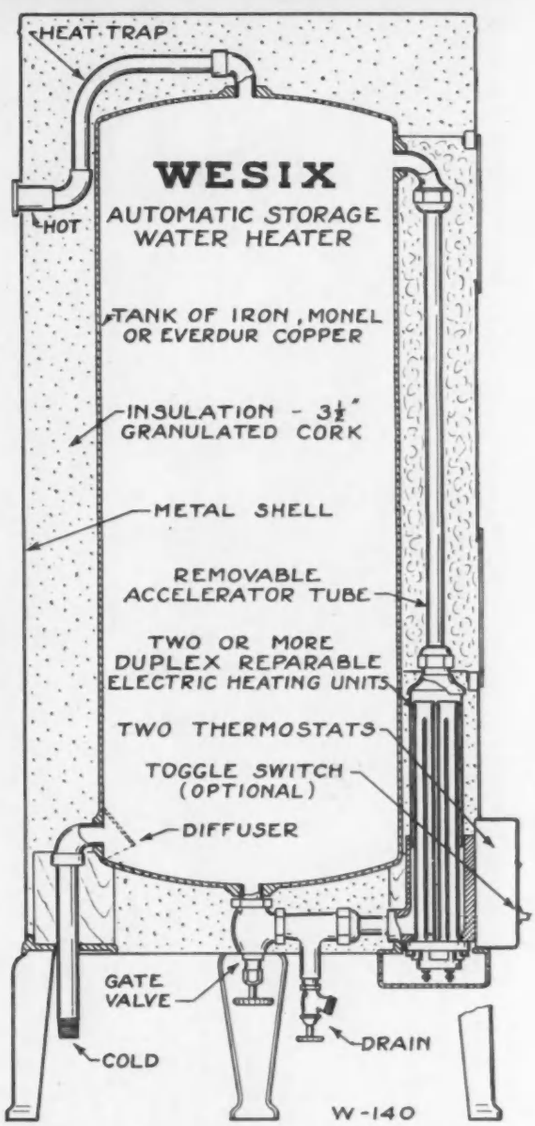
6. ACCESSIBLE. Wiring, terminals, heating unit, thermostat, and switch are of highest quality and are all readily accessible at one point at the base of the heater.

7. FOR ANY RATE. Styled to fit any meter rate, any flat rate, any off-peak rate, any booster rate, and ANY FUTURE RATE.

8. ECONOMICAL. The most efficient and economical of all storage tank water heaters. Built to Wesix specifications which **are more exacting than those of any utility.**

9. CIRCULATION HEATERS. Same assembly available as circulation type heaters for use in converting present tanks.

10. GUARANTEE. 10-year guarantee on iron storage tank heaters. 20-year guarantee on monel and Everdur copper.



And Look at the PRICE —as low as $59.50 RETAIL!

Please don't let the low retail price mislead you. The Wesix is so popular that the economies of **full capacity production** enable us to set this low retail price without sacrificing quality. In fact, the Wesix of today has more features and is better made than it was a few years ago—even though it is priced for FAST SELLING nowadays.

Ask about our Full Load to Quarter Load Automatic Double Throw Switches and Timers which eliminate "new costs to serve."

WESIX HEATER FACTORIES: Los Angeles - San Francisco - Seattle

Greetings to the

May we present — this complete exhibit

Here you will find 288 pages of illustrated descriptions of Benjamin Reflectors, Lighting Equipment, Floodlights, Fittings, Sockets and Signals to meet the electrical needs of commerce and industry. There is also much useful engineering data to help you select these products to meet the specific requirements of each installation requirement. Catalog 26 is yours for the asking.

Benjamin Electric Mfg. Co.

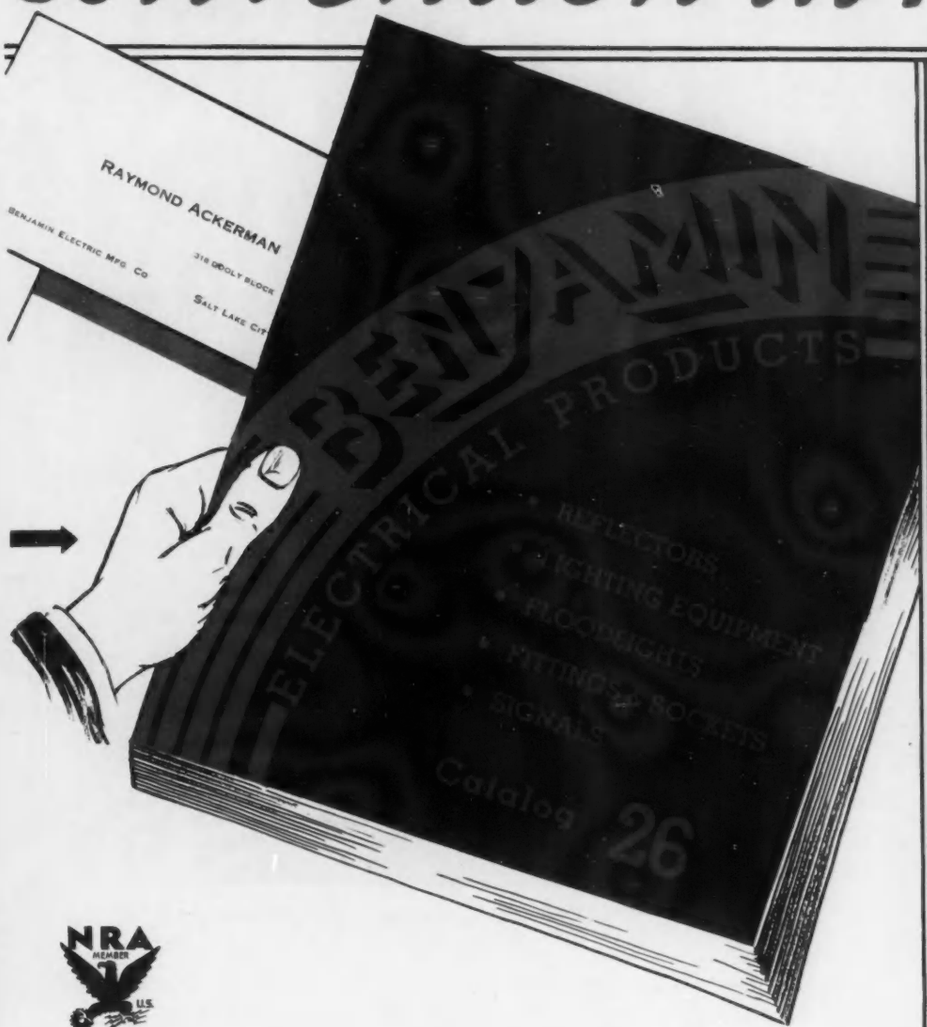
Des Plaines, Ill.

448 Bryant Street **San Francisco**

BENJAMIN REFLECTORS

TRADE MARK

Convention in Print



NRA MEMBER U.S. WE DO OUR PART

An Outstanding Line of Floodlights for Every Purpose

The popularity and dominance of Benjamin Floodlights is evidenced by thousands of installations in every part of the country, and particularly here in the West. In the Benjamin line you will find floodlights specially designed for lighting of night sports, recreational areas, pavilions, parking lots, automobile service stations and gas and oil filling stations.

Benjamin "Play-Area" Floodlight

Benjamin "Elliptelite"

Benjamin "Duo-Service" Floodlight

Benjamin Enclosed Projector

BENJAMIN FLOODLIGHTS

TRADE MARK

HOTPOINT *presents*

A LEADER FOR SUMMER SALES

Tie up with this Summer Range Drive

See Hotpoint's double page national advertisement in the July issue of McCall's Magazine—out June 8—part of the electric range manufacturers' concerted program to keep range sales booming. Watch for Hotpoint's national advertising every month in leading women's magazines. Get the facts about the dynamic "Take Up the Slack" Summer Campaign.

"THE MIRACLE"—*a new style leader at a new price*

HERE is the new Hotpoint style leader priced to get for you a volume of business that will defeat the summer slump. It is a full size, modernly styled table-top range with three units and Thrift Cooker, priced on a new basis, especially attractive to utility companies. The Hotpoint district representative in your territory can give you prices and details.

The new "Miracle" is a range with a wide appeal to your customers. It is presented at this time to give you a live, fast-moving number to feature in Hotpoint's "Take Up the Slack" campaign for summer.

Never has there been a time so ripe for active range selling. June and July sees the largest volume of electric range advertising which ever appeared in any single issue of a national magazine. Hotpoint has two facing pages in the July issue of McCall's in addition to national advertising every month in other leading women's magazines.

Hotpoint's midsummer activity, backing up the new "Miracle" range, is released at a time when range sales are hitting a pace never before experienced in the industry.

The McCall's concerted drive, Hotpoint's sustained national campaign, the "Take Up the Slack" summer activity complete with a new merchandising program, newspaper advertising, window display material, direct mail, etc., are designed to make this your greatest range year.

Get in touch with the Hotpoint district representative at once for full details.

EDISON GENERAL ELECTRIC APPLIANCE CO., INC.
5612 West Taylor Street, Chicago

ELECTRIC RANGES *Hotpoint* **WATER HEATERS**

ELECTRICAL WEST

[*Devoted to the economic production, transmission and distribution of electric power and its application to industry, commerce and the home in the Pacific Empire, and to the sale and distribution of electrical utilization devices, equipment and appliances in that area*]

June 1935

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WELCOME

MEN and women of the electrical industry of the Far West, it is an honor and a privilege to welcome you to this third annual all-industry convention-in-print. Because economic conditions preclude a flesh and blood meeting, we offer this substitute, a "paper" convention, complete except for the fellowship of lobby conversations, locked-door conferences and conviviality, convention entertainment (?) and a golf tournament.

Why any electrical convention in this year 1935? The reasons appear obvious: To gage opportunities, which today are greater than ever in the fifty-year life this business of supplying the public with electrical conveniences and comfort. To focus attention on major problems and to discuss their solution, because seldom has history recorded a period in which problems were more trying. To stimulate progress and development at a rate in keeping with the industry's record of past achievement. To interchange ideas and experiences because only by such interchange may progress continue. To review policies in the light of changing economic, social and political conditions. And finally, to renew courage and optimism, for without these opportunity is fruitless and the future without hope.

To fulfill these purposes the editors have assembled an unique convention program, which departs from precedent in many respects. First, it is truly representative of the whole industry. Each branch has its speaker, presenting its problems, making its appeal for understanding, consideration and cooperation. There is even a representative of the consumers offering a fresh viewpoint on some of the industry's problems. Secondly, as a result of the year's work of the Pacific Coast Electrical Association, the rank and file is given an opportunity to express its opinions on a selected group of problems. There are presidential addresses that inject the spirit of leadership into the program. Reports of the various committees of the Northwest Electric Light and Power Association provide needed interchange of experience. Then too, there is the convention "exhibit" comprising advertising pages which show new products and services that will increase efficiency of operation, reduce costs or build new loads.

This meeting by proxy thus presents in permanent form for mature and leisurely consideration, a complete convention program—conceived for the advancement of the industry and the individuals in it, designed to help *you*, whatever your place in the industry may be, to do a better job.

As you turn this page, the convention will be in session.—*The Editors.*

We Must Regain Favorable Public Opinion

By ARTHUR H. MARKWART
President, Pacific Coast Electrical Association

THIS convention in print marks the first anniversary of the Pacific Coast Electrical Association since its reorganization and incorporation last July. In reflecting the policy of certain of its membership, namely the utilities, which were being denounced all over the country for alleged iniquities, the association, which had been a very active organization for many years, while not "silently stealing away" all but "struck its tent" in 1932. Perhaps this was wise in the face of political and economic conditions which prevailed. However a nucleus was maintained. This was well, for it enabled us to restore our scattered forces and adopt a policy of action in the summer of 1934 to solve numerous problems peculiar to a reconstruction era.

After a period of dormancy during 1933 and part of 1934, steps were taken a year ago toward a moderate resumption of activities and upon a much broader basis of membership, in which the electrical manufacturer, the wholesaler, the dealer and the contractor could participate on an equal footing with the utility and its employees. In its new corporate form the association became a truly electrical industry undertaking.

Following immediately upon the reorganization, two major sections were established: one on operating economics, and one on business development. For the section on operating economics, R. R. Cowles of the Pacific Gas and Electric Co. was appointed chairman, with K. B. Ayres of the San Diego Consolidated Gas & Electric Co. as vice-chairman. The section on business development was headed by Hugh M. Crawford of the Pacific Gas and Electric Co. as chairman, assisted by C. W. McWhinney of the Southern California Edison Co. as vice-chairman.

Efforts were directed to the formulation of a program of activities at minimum expense, which would not only be of maximum benefit to the industry as a whole, but one in which the greatest number possible of our widely scattered membership could feel that they were having a part. The outgrowth of this was the inauguration of the two Fall conclaves, held in San Francisco and Los Angeles, at which a few outstanding problems of the industry were presented by those best acquainted with their many ramifications. These two conclaves were held in November and, except for the competition that was to be conducted for written solutions to the eight industry problems presented then, it was the intention that this would complete the program for 1934.

The enthusiasm was quite unexpected and the attendance most gratifying and many were of the opinion that the material developed from the discussion of the eight problems was of very real value; and that instead of closing the competition as was first planned in the columns of *Electrical West* which had offered its services, that it would be desirable to schedule some activity in the way of a meeting for the Spring of 1935. It was felt that since "enthusiasm is not self renewing" this was necessary in order to carry over the interest aroused to the time of the next conclaves in the summer or fall of 1935. Such a meeting it was thought would serve admirably to bridge the interval and would in large measure round out the work of the 1934 conclaves.

"What the electrical industry needs more than anything else is a plan which will counteract the efforts of the administration, politicians and bureaucrats to injure the utilities and discredit them in the eyes of the public. Our problem is to regain favorable public opinion."

This proposal when presented to the board of directors of the association and to utility executives aroused sympathetic response and general approval was given to hold a Spring meeting in Fresno at which those writing prize winning papers in the solution contest and certain runners-up would be in attendance to present and discuss their papers and receive their awards.

This method of presenting certain problems of the industry in conclaves and inviting participation in written solutions was new and entirely untried as an association procedure. The remarkably widespread support which it received and the exceptional quality of a great many of the papers themselves was most gratifying.

Both to arouse interest in the contest and to insure an adequate attendance at the Fresno meeting, several of the larger companies inaugurated preliminary company contests among their own employees, offering trips to Fresno as prizes to the winners. This support on the part of the managements of the larger member companies was most effective, judging from the results which it secured.

There was a total of 726 papers presented on the eight problems, representing a participation of one out of every three of our members. The employees of 12 of the class "A" company members were represented in the contest. Of the total, 49 papers came from employees of electric manufacturers and wholesalers, indicating an interest more than proportional to the number of their employees, as compared with the larger numbers employed by the utilities. The geographical distribution of the papers was wide, as was also the type of employment of the authors. Except for executives, who were barred from the contest, all points of view were represented in the solutions offered.

The final distribution of the 24 prizes was quite as wide as had been the submission of the papers, namely:

Pacific Gas and Electric Co.	7
Southern Sierras Power Co.	5
Southern California Edison Co.	5
General Electric Co.	3
Coast Counties Gas & Electric Co.	1
Los Angeles Gas & Electric Corp.	1
San Joaquin Light & Power Corp.	1
General Electric Supply Corp.	1
Total	24

There were 15 other papers which approached so closely to the prize winners that judging among them was rendered particularly difficult. These were, however, given honorable mention at the meeting.

Even though among the many papers there were some that indicated a lack of fundamental knowledge of the facts, the prize winning papers and many which were not, displayed conscientious constructive thinking and intense interest on the part of those who were close, and many who were not close, to the problem they were endeavoring to solve. The most important thing was the fact that one of our major objectives was attained, namely that of providing an opportunity for personal expression with immunity by those who for one reason or another might never have had such in the past. Never before have employees in general had extended to them so ready a channel for the presentation of their ideas. Many have hesitated, in the past, to advance thoughts at variance with the established practice of their respective companies. This hesitancy was, in a large measure, allayed in this contest by the confidential character of the competition, and by the assurances from company managements that constructive discussion of such more or less controversial matters was invited.

The value of these solutions to the industry in large measure is emphasized by a quotation which Victor W. Hartley, Managing Director of the association, brought to attention recently:

> "The worst thing you can do with a notion with which you do not agree, is to try to suppress it by force. That only drives it underground and makes it dangerous. If a doctrine is sound it ought to be heard freely, so that it can be spread and approved. If it is unsound it ought to be heard so that it can be refuted and discredited."

It is a striking commentary upon the success of the experiment that one-third of the membership expressed themselves. This indicates that there are many who take serious interest in the problems which confront the industry. There were employees also who presented successful papers foreign to their own activity. For example, a district storekeeper gave his ideas on "How the domestic use of electricity could be increased," engineers discussed sales problems, and an auditor gave his views of "The most effective means of improving cooperation within the industry."

This practical contact with the conditions is indicated particularly in the replies to the problem relating to customer goodwill and public relations. The frequent contact with this problem in practice perhaps accounts for the fact that over half of all of the papers submitted in the contest were written in answer to this problem.

Another major objective was the garnering of ideas, and it is felt that the contributions from the membership, including many of those not presented at the meeting, are of real value to the industry and that the managements of the utilities and the leaders in the industry in general will profit greatly by giving thoughtful consideration to the many ideas presented, as they were, by employees facing the actual situations on the firing line. It is confidently expected that appreciation will be expressed through taking cognizance of the solutions offered. In a word, having uncovered a "pay streak" assuredly it will be developed.

The registration at the meetings totaled 200. Unlike some such meetings, the attendance was practically uniform at all sessions and was sustained to the very end. In no small measure, this was due to genuine interest in the subject matter of the papers being presented, augmented as it was, by the suspense in withholding the identity of the prize winners.

The attendance of a number of executive officers of the utilities and larger manufacturers and wholesalers was greatly appreciated by those who were presenting papers, and by others participating in the conduct of the meeting. Their presence was construed as indicating the approval of the company managements upon their efforts.

One of the most encouraging facts concerning the reorganized association is the increased membership. Concurrently with the solution paper contest, a special effort was made by a membership committee under the chairmanship of Geo. C. Tenney, with most gratifying results. Practically all of the whole class "A" and class "B" members renewed their allegiance, and considerable numbers of new members were obtained. At present our rolls show 37 class "A" member companies, and over 2,200 class "B" member employees with some 35 class "C" members, making a total of 2,272. Like the problem solution contest the increase in membership has been widespread throughout the territory, with an encouraging influx from electrical groups other than the utilities.

As now constituted the association has a broad foundation and thus it is enabled to carry on to any extent that may be desired. While it is not within my providence to suggest problems for discussion during the coming administrative year I am going to take the liberty of mentioning one.

There has been continued propaganda on the part of the Federal government against the utilities, largely in regard to rates, restrictive regulation, and government ownership. This affects the utilities in all parts of the United States. Anyone who knows is fully

ARTHUR H. MARKWART

aware that the propaganda in many instances has been unfair, prejudiced.

The government is spending needlessly tremendous sums in developing hydroelectric properties to duplicate the facilities of private utilities and the legislation which has been introduced in Congress to eliminate public utility holding companies and to dominate operating companies is manifestly unfair.

It seems almost inconceivable that the government should seek to wreck the utilities and seriously impair if not actually destroy the investment therein. Nevertheless it looks as if the objective, if not actually spoliation, is circumscription so as to render impossible the continuation of the marvelous and unbroken progress they have made.

These activities, inimical to private enterprise, are of the gravest concern not only to the owners of the utilities but also to their employees. Both should realize the gravity of the situation.

Therefore, what the electric industry needs more than anything else is a plan which will counteract the efforts of the administration, politicians and bureaucrats to injure the utilities and discredit them in the eyes of the public. Our problem is to regain that favorable public opinion enjoyed for many years and now all but lost through vicious and organized attack. The solution will be found through some plan which will discount and render impotent the vicious propaganda of allied governmental groups, nullify their adverse influence and which will reveal to the public the real menace that is being concealed in the "pea and shell" game of professional politics.

Ready for a Leading Part in National Recovery

By GAYLORD B. BUCK
President, Rocky Mountain Electrical Association

WITH a newly-created and powerful advisory council to guide it, a highly-geared business-development program is in progress in Colorado, New Mexico and Wyoming, under the joint administration of the Rocky Mountain Electrical Association and Electrical League of Colorado. Every branch of the electrical industry—distributor, contractor, manufacturer, dealer and utility—is represented on the coordinating board, the chairman of which is Guy W. Faller, vice-president and general manager of the Public Service Company of Colorado.

Devised by the electrical association primarily as a temporary appliance-marketing and load-building measure, the program has developed into an established business-getting vehicle, the returns from which are already apparent. Under the expanded program, the several objectives are being pursued through eight major divisions and 29 committees and sub-committees, all of which are linked with the advertising and publicity committee, hub of the organization set-up.

More than 125 men and women, recruited from every branch of the business, make up the membership of the various promotional units, which include: Electric Cookery, Refrigeration, Lighting, Air Conditioning, Wiring, Power Sales and Radio. Functioning therewith are the following committees: Membership, Trade Relations, Women's, Industry Education, Program-Attendance, Electric Institute.

With an organization set up in this manner, the association is prepared to render a wide range of valuable services to its members and others engaged in similar business. Such services include advice as to selling methods, window display suggestions, advertising ideas and seasonal sales campaigns, to coincide with national and regional promotional activities. Cooperative effort, under intelligent direction, to the end that all members shall share the customers' purchases, has been the main objective.

The program embodies regular biweekly luncheon-meetings, during which the various campaigns are discussed and analyzed, the entire membership participating. Out of these conferences, plus the interim activities of the several groups, sales of electrical appliances and services by the entire industry have been increased in no uncertain manner, absolute cooperation on the part of all concerned being the secret of success.

The Better Light-Better Sight activity, synchronized with the national program, has resulted in the establishment of new standards of lighting in the home, schools, libraries, stores and in industrial and commercial places. It also is having a profound effect in preventing eye-sight defects and impairments.

Yard and garden lighting, for beautification and protection, also has been greatly stimulated through the efforts of the association, as part of its labors in the lighting field. Already some of the nation's outstanding yard lighting experiments are to be seen in this territory, notably in Denver, where the movement first started.

One of the most recent projects which the electrical industry actively supported was the federally-owned Home Modernization Fair in Denver. Another recent activity with a national aspect which the association supported was the annual "Clean Up-Paint Up" campaign. In this region "Light Up" was added to this nationally-known slogan, in all of the accompanying advertising and publicity. All participants in the campaign expressed the belief that this addition has benefitted the movement materially, as it was emphasized that adequate and proper lighting is a partner of clean, well-painted interiors and exteriors.

Department stores, furniture stores and establishments handling electrical merchandise have "joined up" with the association in a cooperative sense. They are lending their support to the business development program, through cooperative advertising and the practice of sound merchandising methods.

Inspired by the satisfactory results of the past year, and the scope and promise of the newly-inaugurated program, the members of the association and league have just approved an enlarged budget to carry on for the current year. This budget is in addition to the regular advertising and promotional expenses of the utilities and other establishments.

It is hoped that the association will be permitted to assist in future government-planned programs for home modernization and building and similar undertakings. For we feel that we can be of great assistance in bringing about economic recovery, if permitted to do so.

While our main objective at the present time is business-building, we have not overlooked activities which will serve to promote the arts and science of the industry generally. Committees are maintained for developing and advancing the industry in all its phases. Industrial development is one of the aims of the engineering section. Accounting and other subjects also receive their share of the association's attention.

As the business-development program is developed, various items of merchandise still in their promotional stage will receive increased attention, notably air conditioning.

If we have accomplished anything worth while during the past year in the Rocky Mountain territory—and we believe we have—it has been due to the untiring efforts of the members of the association and other interests who have so effectively worked with us. If we have learned anything worth while—and we think we have—it is that we have benefited or taken unto ourselves in proportion to that which we have contributed in zealous effort and cooperation. It has required much hard work and planning, but we know we have been repaid many times over, as evidenced by tangible results.

As we contemplate the future, we know we have an added advantage in that we are organized and ready to take a leading part in the recovery procession which is on the way. We are not going to be compelled to sit on the sidelines and watch it go by.

The Tide Is With Us

By L. R. COFFIN
President, Northwest Electric Light & Power Association

L. R. COFFIN

THE members of the Northwest Electric Light and Power Association have again gathered together in the unique "Convention in Print" made possible through the splendid cooperation in our affairs by ELECTRICAL WEST. It is most unfortunate that conditions have made it impracticable for us to indulge in an old-fashioned convention, but I think you will all agree that a great deal of good has come through the publication of the papers that have appeared at the meetings of the sections of the association during the last fiscal year.

You will remember that our good friend, L. T. Merwin, president of the association last year, was asked to contribute what he called "a sort of President's Address," and that in doing so he very ably reviewed the situation for his presidential year. I have been asked to do the same thing but, as you can well understand, I follow with some trepidation in the footsteps of one who has contributed so much to the association over a long period of time as has Mr. Merwin.

Those members of the association, who have taken an active part in the section activities, will I think agree with me that the accomplishments of the association during the past fiscal year have been unusually helpful. Those members who have not been in a position to contact directly these activities have an opportunity through this "Convention-in-Print" to review the work that has been done, and I think each member owes to the association and to those members who have worked so hard, the obligation of reading carefully all of the printed matter pertaining to the year's activities available elsewhere in this issue of ELECTRICAL WEST. Not only do such members owe this obligation to themselves but to their employers.

In these times of stress and uncertainty it is interesting for one to note the prominent markers of change in the channels of business and social activities. Last year the theme of Mr. Merwin's report was that the association was a "Going Concern" and that the industry had reached a position where to quote from his statement, "I think it is safe now to say that some headway has been made, that the flow against us is less violent, and that while we are still swimming upstream, we can at least feel that we possess the strength and ability to breast the current and reach the quieter waters above." Since that was written, and judging from the enthusiasm of the various section meetings and from the factual evidence submitted at these meetings, the industry has reached a point in the channel, using Mr. Merwin's metaphor, where the tide is at least slack if not definitely with us.

The keynote of the Business Development Section, at its meeting in Vancouver, was the presentation of factual information based on 1934 performance that would be helpful in planning 1935 activities. The facts presented all proved that during the latter part of 1934 there was a very definite upturn in customer demand for utility service. It was further brought out prominently that the extent of this demand was in proportion to the energy put into securing it. The development of these facts went a long way toward inspiring all those who attended that meeting with the confidence that sales programs could be developed with a reasonable degree of certainty of successful performance.

Experience for the first part of 1935 has proven, beyond question, that the predictions of growth indicated by 1934 performance are being exceeded. It is my personal opinion that the inspirational value of the Business Development Section meeting was well worth, of itself, the cost to the member companies of carrying on the association's activities, for out of it came a new spirit of confidence in the future, a new respect for the value of the service which the industry renders to the public, and a new source of self-satisfaction and pride in being connected with this great industry.

I do not wish to let this opportunity pass without expressing to Mr. Murrin, president of the British Columbia Electric Railway Company, and to his very able organization, the thanks and appreciation of the association for the very excellent manner in which he and his organization, as the host company, took care of the Business Development Section meeting in Vancouver. The British Columbia Electric Railway Company, although for many years a member of our association, was for a time not associated with us and only recently came back into the fold. I am sure I am expressing the views of all members of the association when I state that we are more than glad to have that company back with us.

While exceptional demands have been made upon the engineering and operating personnel of all Northwest companies during the past year, necessitating curtailment of many usual activities, the Engineering and Operation Section of the association was able, nevertheless, to carry on with some of the more important functions falling within its province.

The executive committee of the section met in Seattle in September to outline the work for the year, and met again in Portland in February, at which time plans for the annual meeting of the section were brought into final form. The annual meeting was held in Seattle, May 9 and 10, with a registered attendance of 179 — the largest since pre-depression years. There was a high percentage of attendance at the individual sessions and interest throughout was exceptional and sustained.

The activities of the section during

the year reflected the activities and interests of the engineering and operating personnel of the member companies of the association. Among these interests were:

Load Building, including water heating, house heating, better lighting program and the possibility of building load through the extension of engineering advice to industrial customers.

New Sequence Metering as a means of reducing theft of current and also for providing more cheaply the special connections required for range and water heater installations.

Maintenance and Inspection Methods were brought under scrutiny with particular reference to determining the frequency of inspections necessary to obtain the most economical results in upkeep in the various classes of equipment.

The usual liaison was maintained with committees of the Edison Electric Institute and with local code-making authorities. The code committee of the section met with the Department of Labor and Industries of Washington on several occasions and rendered valuable assistance in the formulation of a new code of safety rules for electrical workers. This committee also kept in touch with the wiring codes passed at the last session of the legislatures of Washington and Oregon.

The Accounting and Business Practice Section presented subjects of unusual interest at its annual meeting held in Portland on June 17 and 18.

At this meeting Credits and Collections which, under existing economic conditions, is of extreme importance to the industry, was given a great deal of prominence in the program.

Discussion of the subject "What We Are Doing to Improve Customer Contact" brought forth many suggestions which no doubt will be helpful in this important phase of our business.

Other matters of particular interest to the accountants of the industry which were presented included the following:

Manner of Reporting to Accounting Department—Physical Property Retirements.

Manner of Preparing and Presenting General Financial Statements.

Internal Auditing.

Classification of Accounts. (Open discussion.)

Other items of more general interest presented at the meeting included:

Activities of Utility Securities Owners' Associations.

Budgetary Control.

Securities and Exchange Act.

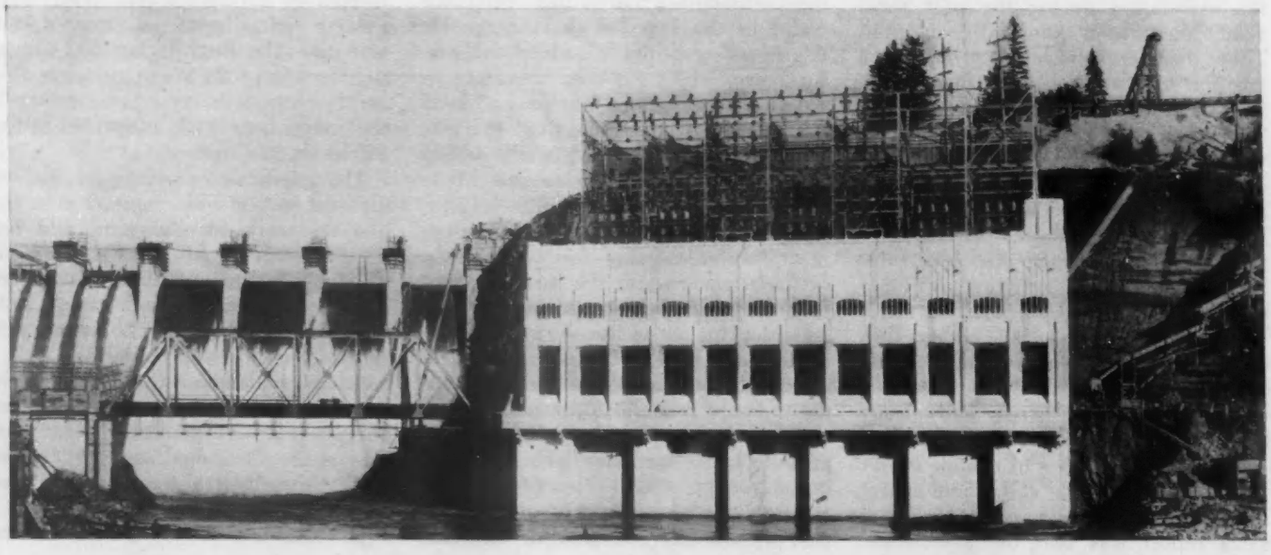
Taxes (particularly as they affect Public Utilities).

The section has made a change in its committee structure eliminating the committees which included general accounting, customers' accounting, regulation and taxation, and research and statistics. Instead of assigning work through these committees the various members of the executive committee have been assigned specific functions and it is the plan of such members to assist one another as much as possible with relation to performance of those functions.

The present set-up and performance of the association compared with predepression days has been likened to the comparison which one might draw between the large expensive automobiles of six or seven years ago compared with the modern inexpensive cars of today. The chief charm of the older models was their comfort. They were, however, expensive to operate and inadequate from the standpoint of modern traffic conditions. The modern cars are less expensive to purchase, more economical of operation, and will outperform in most every respect the older models referred to. Similarly, the association used to be expensive to operate. It was comfortable from the standpoint that everyone had a good time at the annual convention, but it was too cumbersome and unwieldly to meet quickly the constant changes in conditions. The association, as now organized, is very economical and develops a high intensity of useful performance.

It is my sincere hope that conditions will improve to such an extent that a modified vehicle, something between what we now have and what we used to have, may be developed so that more people may have an opportunity of participating in some phases of the work and of the fellowship which is so essential as a continual inspiration to mutual effort.

In closing I wish to extend my personal thanks and those of the association to the section leaders, to the committees, and to the individuals who have given so much time and energy to the association's work during the past year and who have contributed so much to the advancement and welfare of the industry in which we are all engaged. I believe that the truest appreciation of what has been done can be expressed by the members themselves in carefully studying the various papers that have been submitted and upon which so much thought and effort has been spent.



Ruskin plant of the British Columbia Electric Railway Co., Ltd., is one of the mainland stations supplying that company's system

Bill Jones Speaks + + +

to the Convention

Gentle critic who drops in on his friend the local manager is Bill Jones, ordinarily. In that role he pokes a worldly wise and penetrating insight into some of the problems of sales and customer relations, for he IS the customer. Today he addresses the convention with an inspirational message that should fire the initiative of a courageous industry

GENTLEMEN of the Convention-in-Print: It is a pleasure and an honor to attend your meeting; a privilege to be accorded opportunity of mentally associating with minds directing an industry which has accomplished so much for mankind.

Other meetings of an entirely different character are taking place throughout this land today, and they also are being addressed by experts in their lines. Some of these latter made their appearance shortly after the advent of Adam and Eve, and they succeeded in despoiling the Garden of Eden. All throughout history they have been the destroyers—never the creators. When Pilate seemed to listen to the promptings of his heart and of his brain, they insinuated their poison into his ears, and then, as now, incited the mob to crucifixion. Every war, retarding the development of civilization and crushing the bloom of humanity, has had in its background these same gentry. Now, we again find them arousing the populace to cripple and hamper the very beneficient forces which have lifted the race from slavery to freedom. Their mark of desolation and despair has been impressed on every age which has tolerated them—the Demagogic Politicians.

With humility I desire to pay my unrestrained tribute to you gentlemen for the sort of enemies you have made. I implore you to keep the faith; to hold high your heads; to let the supreme consciousness of your magnificent achievements remain undaunted by the yelping of these would-be devastators. Yours is the pride of satisfaction in a task well forwarded.

In the span of fifty years your industry has done more for universal education than have all of the colleges of the land. You have contributed more to the wealth of civilization than have all the other single forces of the earth. You have lengthened the span of human life more than have all the doctors in existence. You have done more to abolish human bondage than have all of the emancipators since the beginning of time. You have annihilated time and distance. You have raised the standard of living at a ratio not even approached during any thousand-year period of the race.

You have done more to abolish poverty and to release shackled minds than have all of the rulers of the world a hundred times over. You have rescued the human soul from the depths of despair and the crushing weight of helplessness that it might soar to the realm of creative and satisfying achievement with enriched mind.

More than any other single power, you have improved the condition of all mankind. Largely because of your genius and your vision even the "forgotten man"—now on dole in a political depression—can live as was not possible for royalty itself some centuries ago.

In fifty years you have given your country a capacity and an opportunity for happiness, for individual independence and growth, for profitable leisure and for comfort that dwarfs into insignificance the puny efforts of the blatant demagogues of all the ages.

Without blare of trumpets; without ostentation—simply as a part of the day's work—you have done all of these things and more, to make real the dreams of the "abundant life," the "planned economics," and the "social securities." And you have done so by upbuilding—destroying nothing.

For developing the beneficient and bountiful force—electricity—to its present state of availability and its present low price, you are classed as exploiters of the poor, as robbers and blackguards. But you have reason to view the future with courage and conviction.

Not for always can moronic governments and voluble montebanks fool all of the people. If, from their inception, government had had control of the public utilities, we would still be lighting our homes with candles. If government had taken them under its blighting wings twenty-five years ago, we would still be using carbon filaments.

Perhaps your present task is to make these truths known to all the people. In face of the criticism and vituperation you have been forced to submit to, this may seem like a hopeless task. So, too, seemed the task of Him who died two thousand years ago that truth might live.

Take heart! Sanity and common sense *will* return. The charlatan will be less fashionable. The emotionalism of today will soon have run its course. It is a fundamental law of nature, of economics and of logic that such will be the case. Truth and honest service will again be appreciated. The very intensity of today's destructive flames will all the quicker consume the fuel which feeds them, and a disillusioned and disgusted people will return to calmness and to the principles of the Fathers.

In the Other Fellow's Shoes

By N. H. CALLARD

Pacific Coast Manager, Central Station Dept., Westinghouse Electric & Manufacturing Co.

PUBLIC utilities, operating in a non-competitive field, may feel that good public relations are a problem peculiar to their own field of endeavor. However, even though most manufacturers are in a highly competitive business, customer relations are probably their largest problem, also. A manufacturer's attempts at handling them might, inferentially, throw some light on the general public relations problem.

A manufacturer may produce a well designed, properly made device; sell it at a price consistent with its inherent worth and utility; and yet go bankrupt if his selling policies and his personnel are not properly attuned to the market he wants to serve.

Selling policies and the selection and training of personnel should be the particular responsibility of that portion of an organization in direct contact with customers. Unquestionably, the largest problem is the individual who represents his company to their customers. Here is where the work must be done, for "public relations" are *human relations* and we cannot hope to improve human relations by any other method than seeing that our part of this relationship is *right*.

Several years ago, Rudyard Kipling gave a talk before a boy's school in England and, among other things, said, "Most injustice is not inflicted deliberately, but because people do not take the trouble to think things out." Here is the big problem—not thinking things out. It applies to us and it applies to our customers.

A manufacturer spends a fortune in developing a certain product—a small competitor comes along, copies the device, and gets the order because of his lower price. A utility installs a fine power plant, duplicate transmission lines, automatic reclosing switching equipment, feeder voltage regulators and every other known device to give its customers 100 per cent service at a consistent price—and yet the consumer will lend an attentive ear to the first fly-by-night who comes along and whispers of a few mills less on his power and lighting rate. Such happenings would not occur if our customers thought correctly. Why don't they? Because, we ourselves don't think right on the matter and consequently do not keep our side of the picture before our customers in the proper manner.

Since our personnel have the responsibility of seeing that our customers think correctly in reference to our companies, it is logical to attack the problem by analyzing the personnel situation; the supervision of it; and the broad company policies backing up our personnel. Some rather disassociated vignettes of a few sales problems will be useful in forming a background supporting certain conclusions. This is not a dissertation on personnel training, but so many of the factors affecting our problem are so closely allied to personnel, that a study of this phase is inescapable.

First of all, we must establish some standard for the selection of personnel. We must consider our organization from the point of view of our customers, rather than how well a certain individual gets along within his own organization. It is frequently observed that some people who work best with customers, have trouble in working smoothly within their own organization —the contrary is also true. Therefore, management, must make the decision as to which type of person is the most valuable to them and, after making the decision, which must be obvious to all of us, *support* that individual within his organization.

There seem to be about six points necessary, for a man to have, to get along with customers—alertness of mind, horse-sense, charm, keeness of vision, courage and enthusiasm. Where are we going to get such men and women? There are lots of them! It must be admitted that it is difficult to develop charm in a person without it—and it is hard to create enthusiasm in some people. The other points, however, are going to develop pretty much as we *permit them to develop*.

The development of personnel should be considered in much the same way as the training of a child should be. Most of them want to do right—think right—grow into a greater fullness of human endeavor. But, they get crossways at times—they get off on the wrong foot. If we give a real part of ourselves to them—are tolerant of their errors—have their confidence—we are in a position to help and guide them and mould them into the kind of people they really want to be. In like manner, if we can build up a strong bond of understanding and confidence between management and personnel, we can build them up to a point of effectively handling our customers. Here is the human relations problem within our own "balliwick."

This feeling must be engendered from the top downward. As we are considerate and understanding of the people reporting to us for direction, they in turn are considerate and understanding of the organization below them —and so on down to the janitor and the scrubwoman. This is why we all run into situations where we get wonderful courtesy and attention in one office of a company and receive no attention in another office—of the very same organization. You cannot place the entire blame on the individual serving you—part of the responsibility is on the inspiration received from the top. "Hard-boiled" tactics will never produce an organization who can successfully cope with customer problems.

Salesmen, engineers, service men, and so on—in contact with our customers are *the* company. Their poor relations are the company's poor relations. A company may have a very definite broad policy of service to a customer before and after a sale—do the square thing by its customers as they expect their customers to be fair and square

with them. *But that is no proof we perform that way.* An individual is derelict in his duty; the company suffers and we have poor relations.

Why is this so? How can this happen when the policy of the headquarters management is so definite on the subject? Because management cannot know the whole story. In general they only know what employees reflect to them—they are the only ones close to the pulse of the customer and fully cognizant of how the customer thinks and feels. This is the reason that the importance of tolerance and proper bond of understanding between management and personnel was so strongly stressed. Remember the training of a child—how can he tell you of his shortcomings—his mistakes—his hidden fears—his little failures—*if he doesn't tell you?*

Of course, if things go too badly, we hear of them through violent protest from our customers and we jump into the situation and correct the difficulty. But, it is the small thing—the little petty annoyance—that we must be fearful of in this public relations problem. Each one in itself is small and we hear nothing of them. In the aggregate they become enormous and because they are scattered, are so difficult to clear up.

The idea should be developed within an organization that an employee helps himself by taking personal responsibility for failures. If something goes wrong—incorrect material supplied, a delayed shipment, or something of like nature—the man in contact with the customer likes to blame somebody at headquarters or "back East." Immediately the customer loses a little confidence and feels the company is careless or indifferent to his small transaction. If on the other hand, the salesman takes the blame, a customer can understand how an individual can fail—the human element again. People forgive human errors but insist that a corporation be perfect at all times.

The larger utilities and manufacturers must watch this point very closely. A customer wants a special concession of some kind which cannot be allowed. If the employee says that Chicago or "headquarters" will not allow it, a very bad taste is left—the customer saying, "What does headquarters know about my problem?". On the other hand, if our representative goes to him and explains the situation and shows why it cannot be allowed, better relations will be maintained. To be able to do this, our personnel must be so conversant with the *background* of rules and regulations and correct business principles, that points raised by a customer can be settled on the ground rather than saying, "I'll take it up with headquarters." When you take your automobile into the agency service department to have a defective part replaced it gives one a mighty hopeless feeling to have the mechanic say, "I'll report the matter to Detroit and see if I can get an adjustment." We must develop the consciousness that the company is always right in its dealings—it is the individual that fails. Correct thinking again!

It is most essential that personnel handling a certain class of customers be quite intimately acquainted with the peculiar conditions surrounding these customers' requirements and operations. For instance, customers in the metal mining game are primarily interested in mining. They have little interest in motors, transformers, power supply or other details, as such. We can only interest and serve them as we interpret our apparatus, engineering, power rates, etc., into their operating and cost problems—it is necessary to give consideration to the economics of *their* business.

Utilities Are Not the Only Ones Confronted With the Public Relations Problem. Every Firm or Organization in the Industry Has Its Own Problem of Satisfactory Relations With Its Customers, Its Public and Its Personnel. This Convention Speaker Puts the Spotlight on Human Relations in an Effort to Solve This Vital Problem.

This has a further value, inasmuch as the salesman or engineer, knowing the customer's problem, can guide his company's actions so that they will really give due consideration to the problems of the customer. We must carry on our operations from the point of view of our customers—so again, we have the personnel problem requiring correct thinking on the part of our organization to properly reflect a customer's point of view to the management. Our customers are not created to buy from us—we are created to sell to our customers!

There was a case not long ago where a utility was serving a large tire manufacturer who had plants located in several parts of the country. The costs of the plant served by this particular utility were running higher than elsewhere and the headquarters management decided the reason lay in the fact that the plant was not using bleeder turbines to extract power from their process steam. The utility had a representative contacting the local tire company, who was familiar with the tire manufacturing game and, undoubtedly due to this fact, was very close to this local factory organization. Consequently, when this high cost analysis came out from headquarters, he learned of it, and appreciating the economics of their operations, was able to place the matter before his superiors in such a way that they succeeded in having the turbine purchased of just sufficient size to handle the process steam but retained the balance of the load. It is almost certain, that if the utility hadn't jumped into the situation and handled it in a broad understanding way, that turbine equipment sufficiently large to handle the entire load would have been installed.

Which brings us to a very vital problem that has an insidious effect upon relations within and without our organizations—*propaganda.* From our various trade organizations, headquarters people, high pressure commercial heads, we get reams of letters that such and such a competitive device won't work—that the ABC company cannot successfully build a certain type of equipment—that small isolated plants, Diesel installations and a dozen and one other things are unsuccessful. Some big hotel, for example, abandons its private plant and instantly it is taken as proof that no hotel can economically operate a private plant.

How do you re-act when somebody says you cannot do something? What do you usually do when you select a five iron from the golfbag and the caddie says, "You can't reach the green with that?". Most of us will try it out anyway just to prove that our judgment is OK. And peculiarly enough, we are so anxious to prove up on this judgment of ours, that we take unusual care with our stance and swing—and very frequently *do* reach the green.

Since a lot of us are not encouraged to think things out, we seize this propaganda material and have a tendency to go about with a high and mighty attitude that this can be done, or that won't work—without getting into the real situation, studying it from all angles and reaching decisions based upon true facts of the case. Here is where real courage has to be shown by personnel, for it frequently means going counter to management who may believe that if something works in Podunk,

Michigan, it will work anywhere. It took real courage for the utility representative, just referred to, to go to his management and tell them that they had to lose part of the tire company's load.

A rate seems too high—a demand charge appears inequitable for the type of load a customer has—we pull out a rule book and say that is the rate, and the discussion seems to end there. Valuable ground is lost in cementing good relations if these economic problems of our customers are not given careful attention at their inception.

Management must keep in close touch with customer's complaints. This has been referred to in some detail before, but considered at that time from the standpoint of the personnel directly in contact with the customer—and the importance of employees reporting to management the errors they make that may cause annoyance and trouble. Management must follow up complaints to assure themselves that the trouble has really been cared for to the entire satisfaction of the customer.

Breaches between a customer and a representative become more and more difficult to close unless prompt action is taken. A third party, even though employed by the same company, can usually get into these situations and clear them up for both sides. Again it is the small thing that must be watched for—and human nature. When a meter is questioned, the meter tester's report to the customer is usually not sufficient to satisfy him. These complaints must be carefully followed up and a study made of the load through the meter to thoroughly prove to *both* sides that the meter correctly measures the load in question. Troubles and complaints give us a golden opportunity of establishing closer relations with a customer—if we'll only take advantage of them.

We should follow the general principle that the customer is always right. When differences arise we should strive to place all the facts on the table and let the customer make the decision—it is almost always fair. We should do this rather than have a real scrap over the matter and finally get licked. It is poor psychology to have a customer feel that we tried to put one over on him, but he succeeded in licking us. It gets him into bad habits.

There was a utility that had a large irrigation customer where the annual power bill was largely determined by the maximum peak during the irrigation season. There was always conflict. The final billing for the season would be made and then the fight would start. The customer had installed various graphic meters to check up on the demand and they could never agree with the power company's conclusions. Then the customer would contend that the voltage and frequency was bad at the time of the peak so that the pumps had and excessive power demand. In the end the customer would usually win—and gloated and bragged over his victory—bad! Finally the utility established the practice of sitting down with the customer's engineer, considering all factors and establishing the peak *before* the billing was made. That was satisfactory to both sides. Things changed right away; the customer was fair (they almost always are); the peak established satisfied everyone; and they lived happily ever after.

Another point is involved here. In this commercial age of ours, where we are all striving to increase our business, we are prone to spend a lot of time on the account we are triying to break into and somewhat neglect the account that is already giving us a very good volume of business.

We cannot consider our personnel in the mass, for human relations can only be established between individuals. In like manner, we must look at our customers—each with his little peculiarity or pet grudge—as individuals requiring individual attention. We should try to contact our customers as much as possible when a new load addition is not in the air. At such times we get a chance to learn a little more of his business problems and present a few of our own. When a new piece of business is to be negotiated, or a trouble arises, a better bond of confidence has been established.

There is another factor that we must consider—the relation of buyer and seller. Every one buys and sells. The farmer, the bakery, the utility, the artist, the steel plant, the electrical manufacturer are both buyers and sellers. This being the case haven't we all a common meeting point—a common basis of fair dealing and good business ethics? Aren't we all striving to make a profit—to make an honest living for ourselves? Isn't a corporation merely a mass of individuals trying to make a living—just as a farm represents three or four people trying to make a living?

Since we all buy and sell, why should there be mistrust between the buyer and seller? Why should management permit the "buying" part of its business to be ruthless, to discount service, fair treatment, established connections in the community and consider price alone—and then turn to the "selling" side of its business and feel that all of these things should reward them with the order?

In most of this discussion, the remarks have been confined to the customer and the personnel coming in contact with them. Back of this must be a broad company policy of fair dealing, fair charges, proper servicing and general good business ethics. If these are not on the right basis, it is useless to hope for good relations. Management must stand firmly behind their personnel in the handling of these problems. At times they may use poor judgment—make decisions that cost money—but they must be supported. It is through errors that we learn to make correct decisions.

What conclusions can be reached from these remarks? Our relations with our headquarters people must be right. Our relations with our own personnel must be on the right basis of mutual confidence. We must be sure that personnel has a true understanding of our general business problems so that they can stand on their own feet and really represent their company to their customers. People in a supervisory position must have relations with their personnel so close and intimate, that they will be given the chance to help them over the rough spots. We must do a lot of correct thinking in the terms of the customer we are trying to serve.

All of this seems an approach to our customer relations problem. In conclusion, a paragraph from a talk given by Major General Harboard, chairman of the board of the Radio Corporation, to his sales organization several years ago seems appropriate: "Service—the most abused word in the language of modern business—is nothing more or less than placing yourself in the customer's position on the other side of the counter and asking yourself, 'What would I expect if I came into this office for information or to do business?'."

It Is No Sin to Speak Out

By R. F. CROUSE
Atascadero, Calif.

IT is with considerable resentment that I note the disparaging references to the public utility industry today—"power trust" and "holding companies." The charges and accusations, unanswered so far as the general public is concerned, would prompt one to guard as a deep secret the fact that he was connected with a utility or that he was personally acquainted with those responsible for the "evils" and "abuses" attributed to them.

I have no ax to grind; I own no stock; I have had no recent contact with any friends in the industry; I simply am a customer whose only present interest is in the general economic welfare of this country. My attention is drawn to the utilities because of a sincere conviction that an understanding knowledge of the true character of the personnel, of the present methods of regulation and control, of the economic importance as a potential agent for real recovery, and of the fact that the utilities are *now* a "yardstick" not only by which to measure TVA but many other theories of managed economy beyond which lie only dictatorship—a real understanding of all these things by the public will bring support to sound recovery programs, sponsored by American business executives.

The present clamor for a "managed economy"—for government control and operation of basic industries—is from the mass of people who are tired of exploitation, either real or imagined. They do not understand the utilities, do not appreciate the high type of personnel, nor the close supervision and regulation under which they are now operating. Politicians, special privilege groups and others, influenced by malicious or mercenary motives, capitalize on this lack of understanding and divert public attention from their own destructive exploitation and pet rackets to the utilities by accusations, false charges, misstatements of facts and propaganda, which for some reason goes unchallenged.

If the general public had a simple understanding of the utilities and their operation and regulation, it would probably see in the present system the very ideals it is hazily trying to picture —a capitalistic organization contributing equally to the welfare of all parties —labor, capital and the public—an organization founded on personal intelligence and skill, working for community benefit and long run development. If municipal affairs had the same capable management and close regulation as do the utilities, taxes would be in the same category as electric rates, so low as to offer no just reason for criticism.

"As a layman I ask you to grant me space for the enclosed letter to the utilities," the author of this article wrote to the editor. So we put him on the convention program as the representative of the public, whose goodwill the industry is trying to deserve and win. He gives some original ideas as to how this winning may be accomplished.

Because utilities are regulated monopolies, with all of their activities a matter of public record, any facts about them can be secured by anyone who wishes to fight them, but few facts are public knowledge which can be used to defend them. The sole recourse of the utilities is eternally to seek public understanding and confidence and then fight for a fair deal. A public which will pay 25 cents for a tube of tooth paste and 60 cents for a bottle of mouthwash, will pay a reasonable charge for utility service when it appreciates what it is buying.

The automobile industry has given considerable publicity to its economic importance and general contribution to the public welfare. However, the utilities, with a personnel of equal intelligence and capabilities, have been licked by a type of inferior politician, their educational programs have been hooted down as propaganda. It would appear that the utilities have great knowledge but little understanding of public psychology.

From the layman's point of view, a suggested remedy might be found in the appointment of a "social observer" who would view these problems strictly from the standpoint of the general public. Most of the antagonism of the public is based upon questions so simple as to warrant no consideration by utility executives. Among them is the following: "How is the cost of a kilowatt-hour determined?" Very few utility employees can give a satisfactory answer. Because of commission regulation the public thinks that electric rates must be determined in the same manner as freight rates, and therefore clamor and protest may win special consideration for their particular locality or industry. Another question is, "Why not a simple itemized statement on the bill?". The public does not have a "Store open from 7 a.m. to 10 p.m." charge on its grocery bill and it does not want to know about "minimums," "readiness to serve" or "demand" charges on its electric bills.

Many examples can be cited of simple misunderstandings that cause irritation and distrust. These occur not because the public is dumb, but because there is so much information available today, so many activities and interests requiring attention and study that the average citizen has difficulty in determining just where he fits into the general picture. He has no more time to study the fundamental problems of the utilities than does the utility man to study the reasons for currency devaluation in Japan. The public does not want to be educated but it will be informed.

Public psychology should offer no greater problems to the utilities than those which have been mastered by their technical men in building electric service into the constant, high quality economical thing that it is today. Public psychology is more important to the utilities today than any of their technical problems. It must have the same degree of close attention, observation, analysis and clear thinking that characterized the studies of engineering problems in earlier years. Information can and should be given the public which will cure mistrust and create friends.

The alphabetical bureaus, political machines and make-shift organizations have shown their weaknesses, both in their fantastic theories and in the ability of the policians to manage and operate them. When sound and conscientious business leaders and business or-

ganizations make themselves known to the public and cease extending the hand of fellowship to the few who have drifted toward exploitation, we will have a return of public confidence in "big business" and less government interference in private affairs.

Utilities have suffered much unfair treatment due to public sentiment and have retaliated by seeking advantages to offset these limitations. Yet the public has received more value for its dollar, capital has been used to greater economic advantage and labor has been raised to higher standards than in most other industries. These facts should be public knowledge, and they *can* be brought to the man in the street.

We Can All Fight

By JACK DARLING
Plant Operator, Southern Sierras Power Co., Bishop, Calif.

FELLOW employees, our industry today is faced with a crisis that is without precedent. Never before in the history of this nation have we deteriorated to the point where so small a minority became so powerful or so confident as to strike at the very principles upon which our democratic government was founded. Not since the freeing of the negro slaves of the South have we been so near to a new kind of slavery. Must we stand aside, as employees, helpless and bewildered while the crushing tenacles of a bureaucratic octopus reach out, subtly and malignantly attempting to absorb the business that gives us our livelihood?

Whether connected directly with this or any other related industry (and who isn't connected in some way with industry?) are we to allow ourselves to be forced into the lockstep of regimentation? Must we sacrifice our individualism—our personal liberties—just to appease a few pinhead politicians, who are drunk with their power, swelled up with their own importance? Are we to work, eat, sleep, play and even worship to time played by the bureaucratic band?

It should not only be our duty, but our determined purpose, to oppose this encroachment of bureaucracy on our business and our lives. Fortunately we still enjoy the advantages of free speech. Let us take this powerful weapon and use it to protect our jobs, our homes and our liberties. Let us do this now, today, before this privilege, too, is snatched from us. Let us start a word-of-mouth campaign of truth to combat the malicious lies and misstatements of this bureaucratic group.

We can spread this message of truth in our daily contacts with our friends, acquaintances, tradespeople, in fact, anyone with whom we come in contact. We can, by our attitude and actions, let our employers know that we stand behind them one hundred per cent, thus lending them our active support. We can, by our activities and interest in the affairs of our industry, let our employers know that as they have stood by us through all these difficult years, we now stand by them in this crisis.

This is an all-industry democratic convention with every branch and element of the industry represented. So it is only fitting that one of the rank and file be on the program with a message to his fellows. Mr. Darling makes a timely appeal.

Let us unite in a nationwide industrial employees' association for the protection of our industry and, incidentally, for the protection of our jobs and our homes. Why should we, the employees of any one branch of industry, stand passively aside and watch these demagogues, these instigators of governmental dry-rot and degeneracy, attack and persecute any other branch of industry? Surely we realize that what affects any one branch of industry, affects industry as a whole and we as individuals.

This is not a fight of any one particular branch of industry, but industry as a whole will soon be fighting for its existence. As surely as these bureaucrats succeed in socializing one industry they will turn their guns on another and another until they have succeeded in destroying our entire industrial structure and substitute in its stead some fantastic dream of the demagogues.

The leaders of industry will have to unite in this fight, for in unity there is strength. We too, as employees, must unite so that when we see some branch of industry being attacked and persecuted we can lend the strength of our voice and vote to help our fellow industrial employees lest we too shall be attacked. Let us, by our eagerness to join in this fight, prove to our employers that we are interested in our industry beyond the next pay day.

The Trade Has Learned to Value the Wholesaler's Code

By NEWTON W. GRAHAM
Pacific Region Member, Code Authority for the Electrical Wholesaling Industry; Graham-Reynolds Electric Co., Los Angeles, Cal.

IT may seem presumptuous to talk of the National Industrial Recovery Act while the fury of discussion relative to its future is still in progress. Yet we can talk reasonably about what NRA and the Wholesaling Code have done during their short time of operation, at least as far as it affects our industry. We can ascertain whether we feel that the code has been of value, and whether we should like to see it continued in some form or other.

Just prior to this session of Congress, at the request of the code authority for the electrical wholesaling subdivision of the General Wholesaling Code, letters were written to the various commissioners in this region asking their members for opinions on the code and if they felt it should be continued. Despite any impression to the contrary that might be gained from newspaper accounts, the consensus of opinion of the wholesalers on the Pacific Coast is, "THAT THEIR CODE HAS BEEN OF VALUE AND SHOULD BE CONTINUED."

This is encouraging in view of the fact that the General Wholesaling Code has been in operation slightly more than a year—while the supplementary Electrical Wholesaling Code has only been effective since August 13, 1934. When one considers the lengthy conferences and the volume of correspondence necessary before we could get our code into shape for final approval, it is gratifying to know that our wholesalers have been patient and understanding. The rights of all were accorded their proper consideration, it being necessary that the interests of the various participants—consumers, labor, the industry and the administration—should be reconciled.

From the beginning we have found it easy to adopt the code and to function under it here in the West. This must be credited to a long history of cooperative effort and activities in which all branches of the electrical industry have participated for many years. We started with a fine foundation of mutual acquaintances and respect and were aided by many years of cooperative practice.

When the code went into effect, the labor provisions were found to be already in force in most establishments. We have always paid fair wages and by minor adjustments the hour schedules were soon brought into compliance with the code. In some cases this was done by rearranging schedules, in others by adopting a five-day week. On the whole, however, this did not produce much extra employment, since the volume of business at that time did not warrant extra help. Later a general improvement came about and most wholesalers have since increased their personnel.

Wholesalers bring to the convention symposium of industry problems and activities their experience under NRA code operation. Where government seeks to promote self-regulation of business its more natural regulatory function is being served. Trade practice rules are a "yardstick" that business seems to need

Trade practice provisions of our code, likewise, have not been unreasonable nor difficult to live up to. One of the first inclinations was to include price filing or price maintenance of some kind, but by the time our code came up for final consideration at NRA there had already been some opposition on the part of consumer groups to such provisions and they were abandoned. On the whole I feel that this has proved a happy circumstance, for it has made our code fully defensible on all grounds and it has been much easier to obtain compliance.

As it is drawn, our wholesaling code neither allows nor fosters any oppression of the small wholesaler nor does it favor a large wholesaler. If there is any suspicion that someone has been hurt by the code, it is more than likely that his trouble comes from something he has done counter to good business ethics than to any effort to oppress or restrict his operations by the code. All criticisms of NRA to the contrary, no man who has conducted his business in the way that he says he wants to conduct it, or has given others to believe he wants to conduct it, has been hurt by the code.

While our code has not attempted to make any drastic changes in our methods of business operation, it has done much to clarify and to eliminate many of the details which have long given wholesalers trouble. One of these details has been that of setting a definite policy in regard to a date for cash discount allowance. The code provides that the tenth of the month following date of shipment will be the last day upon which a cash discount may be allowed. This has ended confusion and abuses of cash discount terms, abuses originating either by the wholesaler offering a concession or by the customer requesting a concession. To clarify this point the code was amended to read:

"Section 8. It shall be an unfair trade practice for a member of the Trade to grant or *offer to grant* to a customer a discount for cash at a percentage greater than the percentage of discount for cash received by such member of the Trade on the same merchandise, or to allow or *offer to allow* extra discounts for anticipation of payment, or to allow or *offer to allow* a discount for cash on accounts remaining unpaid after the tenth of the calendar month following date of shipment, or to grant or *offer to grant* any discount for cash where payment is made by warrant, note or trade acceptance."

Other troublesome matters which have been more clearly defined by the code have been lump-sum bidding, split shipments, consignment of stock, returned goods, and payment for sales promotional material. With a clear definition to guide us in these matters it is much easier to bring about a more

harmonious member relationship.

At the present time the most discouraging aspect of the code situation is that of enforcement. While the national Congress is debating what to do with NRA, naturally there is considerable uncertainty and indecision in the administrative branches of the government which have to do with local enforcement. Consequently we must rely upon the spirit of willingness and fair play of the men in our business to adhere to the code more as a matter of principle and good sense than as one of mere regulation.

After all is said and done, regulation must be regarded in a favorable light in order to be successful. The legal rules must be personally adopted as a guide to each of us for our own self regulation. If our codes are not regarded in that light they will be ignored or violated and the whole weight of the government will find difficulty in making them effective. On the other hand, if it is recognized that these codes have been of our own making, that they have been based upon our past experiences and our best judgment as to what we consider reasonable fair play in our relations with one another, then I feel, and I believe that the wholesalers of the Pacific Coast feel too, that our business because of them, will be much cleaner, fairer and eventually more profitable.

Contracting Codes Need Simplified Operation

*By LLOYD FLATLAND**
Globe Electric Works,
San Francisco

ONE of the most significant things that have developed out of operation under NRA codes has been what might be called a clear cut view of our business in its relation to other businesses in the economic picture. For many years, in fact since the beginning of the electrical industry, electrical contractors have always considered themselves classified under the electrical industry. However, in the organization of the industries for code operation it was soon discovered that electrical contracting really belonged to the construction industry and was related to the electrical industry only in so far as its sources of material supply were concerned.

This truer classification may give the electrical industry a clue as to why the electrical contractor, when it came to electrical industry cooperative activities, may have seemed to have his attention focused somewhere else. After all it is hard to keep the eye on the ball when there are two games in progress and most of the fellows on your team seem to be in the next lot.

Code activity also made all of us realize that the big job ahead, and the one of most importance, was to take care of our relationship in the construction industry where, whether we liked it or not, our most difficult problems lay. In the beginning, our code was drawn up from the standpoint chiefly of the electrical industry. But when it was grouped in with the construction industry as division No. 6, in the field we found that in order to make the code effective for our own group a certain responsibility rested with us to see that all the other crafts in the construction industry were likewise operating under their divisional codes. In fact, we in the electrical contracting division were so far ahead of the other craft groups, as far as organizing and operation of our code was concerned, that we were embarrassed by the inactivity of the other groups. The building public, which had not been made aware of the provisions of other codes, resented the fact that we were doing our best to live up to ours. In self defense, as well as for many other business reasons, we found we had to assist other groups in the construction industry to become code minded and to operate under their codes, too.

This brought about the Code Coordinating Committee organization in northern California which resulted in the establishment of the Central Bid Depository system previously described in these columns. (See Electrical West, March, 1935.)

Such a coordinating activity also disclosed many other inherent weaknesses in the organization of the construction industry for code activity. Out of this experience and observation, right on the ground, we have developed a number of suggestions for reorganization of code administration of the construction industry which as a Code Coordinating Committee we have forwarded to the construction industry Code Authority and to NRA. Since the electrical industry is involved, to the extent that it furnishes at least our branch of the construction industry with the materials out of which to make electrical installations, I believe it is important that it should know what we have proposed as a simplification and improvement to the construction industry code administrative set-up.

Need Simple Procedure

We realized the great need for a simpler method to bring about close compliance on the part of thousands of practical men of limited business education. The first step, we felt, was to relieve the burden of financing code activity from the building public as much as possible. Also, we felt it was necessary to bring about a better system of understanding as to the rights and obligations of the members of the construction industry so that busy men could immediately find the information they needed and assume their liabilities and responsibilities with their eyes open. Our suggestions were also designed to improve compliance and thereby bring about some of the inherent benefits that are possible to the business of contracting under the code. This in turn would improve public understanding and support of the code and result in a more

* Mr. Flatland writes this as an individual rather than from any of his official capacities. His conclusions, however, are drawn from his experience in the official positions he has held in the following: Member of the Code Authority for the electrical contracting division of the construction industry; 12th Regional Chairman for the Code Authority; executive committee member, National Electrical Contractors Assn.; president, Northern California Chapter, N.E.C.A.; past president of the San Francisco Electrical Contractors Assn.; and chairman of the Code Coordinating Committee of the construction industry in northern California.

willing cooperation from the industry in making the code effective.

Our plan was an outgrowth of practical field experience. The success which the Central Bid Depository System of northern California attained in receiving hundreds of bids and tabulating them efficiently and economically had demonstrated that the industry could be interested in a simple program and would comply if the proper set-up was devised and honestly administered.

The codes themselves, logically enough, were given to the associations of business men to develop. These associations had had experience in the problems of their business and were in the best position to write up codes of fair competition for their business. Naturally, the linkage between the association and code administration therefore has been very close. However, field experience indicates very strongly that for purposes of complete honesty and to be completely defensible before the public, code administration now must be more clearly separated from association operation. Associations as the sponsors of the codes should still be recognized as supporters and sponsors and, on the whole, administration should be entrusted to its members because of their superior training in self-discipline and in the problems of the business. Yet it seems desirable to return association managements more to the improvement of the gains they have made in their memberships through code operation, and to isolate code administration in a more neutral and impartial position.

In order to accomplish this at a minimum of expense and duplication it was recommended to the Construction Code Authority that its own membership be reorganized so that it would consist of a chairman, three vice-chairmen and 20 divisional officers. These divisional officers would each represent one of the craft divisions of the code. This would enable a consolidation of the present 20 divisional code authority headquarters into one, with reduced office personnel and the expense of the various facilities needed to operate.

While this would centralize at headquarters to a certain extent, at that point such simplification would be desirable. On the other hand, a far greater decentralization could be effected in the field. At headquarters each of the craft divisions of the construction industry code would be adequately represented by one member, its interests safeguarded by that representative, who could devote all of his time to the work.

Regionalize Responsibility

In the field the present trend in NRA administration, that of decentralization and of regionalized responsibility, would be followed.

Twelve or more regions would be established geographically. Over each region there would be appointed by the National Code Authority (the three officers and 20 executive officers noted above) a regional chairman for the construction industry, a vice-chairman and secretary. This regional organization would have a staff of from six to nine district chairmen from the general contractors (2A), the painting, plumbing, electrical, plastering and lathing divisions, and from two to seven district chairmen for the remaining divisions, as required by the population and geographical necessities. Such regional offices would have such field assistance and clerical staff as could be financed reasonably from that region.

In each region local coordinating committees or code councils would be set up to operate the necessary central bid depositories and central assessment bureaus required in each metropolitan or trade area. The regional chairman would assist in the formation of these coordinating committees.

Each metropolitan or trade area organization would be likewise simplified to a local coordinating committee, which would be made up of three representatives each from the 20 divisions of the code. Each craft division of the code would have these three representatives, one of whom would be named chairman of his own divisional representation.

Construction codes have been in operation for over a year. During that time much has been learned in the school of hard experience. No one has given so unselfishly of his time, patience, and untiring energy as Mr. Flatland. He observes that in the construction industry codes are needed, that procedure must be simplified, overhead greatly reduced, and that its cooperative benefits can only come from placing the major effort right in the home field

The 60 members thus selected by their own individual industries would constitute a panel for committee work and the conduct of hearings. A regular schedule of hearings for each division would be worked out so that each division would have a designated morning or afternoon of each week at which time hearings of complaints, or other matters pertinent to that division, would be conducted.

To further insure impartiality and fair judgment in these hearings five to seven members from the panel of 60 would be given a definite responsibility for each half day period. Of these five to seven only two or three, at the most, of the division's own members would sit. These would be there to interpret the technicalities of that craft to the other members of the hearing board, who would all be from other divisions than that of any particular respondent coming before it. These other members would view the complaint more strictly from the written code and less from such extenuating circumstances as might influence a member of that particular craft. Thus a more impartial judgment would be obtained and recommendations to NRA for action would be better supported by facts.

Contact and instruction of the various groups would be simplified likewise. From the national standpoint the Construction Code Authority would hold a national meeting quarterly to which the regional chairmen would come for exchange of information and receipt of instructions and interpretations. On his return to his region the regional chairman would call a quarterly meeting of his district chairmen, to disseminate such information and correlate the work of administration in his region. In each area under the district chairman regular meetings of the code coordinating committees and district chairmen would be called as necessary.

As the situation now finds itself contractors from metropolitan areas, having met and dealt with more local administrative problems, have been in a position to override the local administrative committees of some of the smaller areas not sufficiently experienced to properly administer the code and to hold their ground. Education of these smaller committees in code administration work is very necessary and should be done by code agents who have had actual experience in handling and presenting cases to NRA. Many committees become helpless when a worthy case is presented to them. Their first impulse is to send the complaint on up to the next highest office instead of handling it and adjusting it themselves. This lost motion can only be corrected through educational work, explaining the necessity of the various details to be handled, and the proper preparation of a case where, as a final

resort, it is to be sent to the next highest authority. Mere correspondence and the mailing of rules and regulations will not do this. Procedure must be checked regularly, records supervised and the benefit of experience exchanged.

Collecting Assessments

Another important point that can be improved greatly is in the matter of the financing of code administration through collection of assessments. Headquarters is no longer the first point of contact by members of the industry. Being far removed from the jurisdiction of its local agents it does not contact the field intimately. Local administrative committees and the next higher offices, in case of appeal, are those who come in contact with the men in the business themselves. Hence code assessment collection should proceed from the ground up in the same fashion.

We have estimated that in an area comprising California, Nevada, Utah and Arizona it will require approximately $40,000 each year to carry out the work efficiently and to bring about code compliance in the divisions having many specialty contractors. This allowance would permit local administrative committees to function properly, employ necessary office help and field assistance. The district chairmen could be financed to enable them to make visits to administrative committees at least once a month. The regional committee, the next highest in line, could devote more time to proper administration of the code and bringing into compliance the recalcitrant members who are sifted up to that headquarters. Combined expenditures for office help, field assistance, etc. should effect savings to the consumer, who must eventually pay for code administration.

We have taken a typical contract of about $250,000 and computed the various assessments from all of the divisions participating in that contract. Under present basis of assessment somewhat near $700 in fees alone were carried by this job. In other words, approximately a third of one per cent of the face of the contract now goes into code assessments. This is too high a percentage and will be resisted by consumers sooner or later. Therefore it is to the interest of the business as a whole to simplify the costs of code administration.

The consumer, otherwise referred to as the awarding authority in our business, may be either an individual, a general contractor, or the governmental building department in municipalities, states or federal works. In many cases these awarding authorities have been asked to assist in bringing about code compliance. In some cases this creates a hardship for those customers who agree with code requirements. In others the code agents have exceeded their authority in demanding that the awarding authority comply with a code which as a matter of fact is binding upon the member under code jurisdiction and not on the awarding authority. This has caused an unfavorable feeling towards codes and has antagonized the public greatly.

Must Explain To Public

Code Authorities need to educate the industry that the public as such cannot be expected to bring about code compliance for the industry. This educational work might well be undertaken by NRA offices which likewise endeavor to bring about a better public acceptance through wider publicity of the purposes of the codes.

Because the industry is so demoralized and disorganized and because of its mobility and instability it has been almost impossible to gather true records of costs in order to defend the construction industry of the accusations of increased costs. Code Authorities and agencies in their extremely difficult and long drawn-out work of organizing have not had an opportunity to advise the public through well-planned publicity of the true purposes and intents of codes of fair competition.

It is also very plain that if the codes are to work properly, with little resistance and a better understanding from bid takers, it is necessary that every code in the construction industry be enforced at the same time. Our group has recommended that certain definite dates should be set for the operation of all codes and that failing to organize themselves to do so that the local coordinating committee be empowered to set that code in operation for any industry which has failed to take advantage of its right to self-government under the code.

To summarize the chief points of value in this program proposed it must be said that its main purpose is to bring down to earth both responsibility and enforcement. The only place that the job of promoting cooperation between the fearful and suspicious indivuals and divisions of the construction industry can be made effective is in local areas. This plan places the major effort in local areas. It also returns in local, tangible benefits more of the assessments collected. It would reduce the great and top-heavy national overhead, both of associations and of code administration. Such overhead is almost impossible to sell or justify to the man on the ground. He cannot see tangible and visible results from the expenditure of money he collects from the customer and which he pays out he knows not where.

The public too cannot see, and hence fears, a nationalization. It resists stubbornly, and politically, the operation of codes which have the effect of being imposed from on high. Where the tangible benefits of code operation are felt by a local contractor and he recounts this enthusiastically to his customer this resistance to the code is removed and conditions generally will improve. If the truth be known the entire values which lie in the operation of the codes are jeopardized by top-heavy organizations on a national scale of what after all simmers down to adjustment of individual differences between a few local citizens.

While this may seem to be outside the interest of the electrical industry, as such, I can assure everyone that it has a very material effect upon cooperation and the distribution of electrical supplies and materials. With code operation, wherever it has been effective, we have been able to maintain stable conditions that have resulted in material betterment to wholesalers and to manufacturers of supplies. Their prices have not had to be recklessly chiseled in competitive warfare. Quality goods are given a better chance of being sold because competition is removed from price alone. And for the utility a more adequate, a better job goes in, which returns better satisfaction from the consumer, and greater load.

Whether the NRA is continued or not it is my observation that if it is junked in the present political upheaval it will not be long before business demands its return in some form or other. Regardless of all the propoganda to discourage code operation, one thing is certain. That is that business can no longer return to the tooth and claw methods of business operation which unbridled competition gave us. If we who are in business can take the bugs out of code operation and administration these codes will have a much better chance of succeeding and will improve conditions for the entire electrical industry, as well as the construction industry.

County Inspection Proves Worth and Economy to the Public

By ARTHUR C. VEIT

County Electrical Inspector, Los Angeles County, and President, Southwestern Section, International Association of Electrical Inspector

SOMETIMES it takes an earthquake to shake a populace loose from some of the indifference and carelessness of a lifetime. For many years groups in the electrical industry in the Los Angeles territory sought to bring about county electrical inspection. This was aimed at those areas contiguous to the numerous cities in Los Angeles County which were growing up mushroom-like and in which there was no provision for electrical safety in the installations being made. These efforts always met with indifference and a feeling that such inspection was superfluous.

However, when the big earthquake of March 10, 1933, shook down buildings, and especially showed up the flimsy construction of school buildings and commercial structures in unincorporated areas, Los Angeles County awoke to the realization that it needed building inspection. Such protection had been provided by ordinance in the incorporated towns, but in those numerous areas just outside the city limits anything went. And "anything" is a broad term.

Accordingly, on March 20, 1933, an emergency ordinance was passed by the board of supervisors of Los Angeles County which created a county building department. It was placed in charge of William J. Fox, chief engineer of the County Planning Commission. Mr. Fox became head of the Department of Building and immediately set to work to organize the department to function at the earliest possible moment and with the least expense to the people of the county.

The new building department was to have complete charge of building construction, plumbing and electrical work. As to the electrical part of it the National Electrical Code and the State Safety Orders were recognized in the ordinance as the standards for electrical construction within the county.

Entire Gamut of Conditions

Some idea of the problem which faced Mr. Fox at the beginning of this organization may be gained from statistics relative to the size and variety of conditions existing in Los Angeles County. With a total area of about 4,000 sq.mi., the county has a population, outside of the large incorporated areas such as Los Angeles, Pasadena, Alhambra, Glendale, Burbank and Long Beach, of 900,000. The type of terrain includes seashore, a wide coastal plane, high mountains (Mt. Wilson has an elevation of 6,200 ft. above sea level) and desert.

The type of occupancy and industry covered ranges all through the gamut of human endeavor. There are not only rural farming areas of all varieties, but heavy city conditions as well. Some unincorporated districts have large population centers which rival in population density the city of Los Angeles itself. There are seaside shacks and summer cottages; there are mountain cabins in the Pasadena and Monrovia foothills and high in the coast range; there are the desert cabins out in the Antelope Valley desert region; there are wayside oil stations, and small village commercial buildings; there are large industrial centers just outside of incorporated areas (where lower taxes prevail); there are movie studios with heavy use and concentration of power; there are oil fields presenting the hazards of volatile gases; there are various types of residential and commercial occupancies ranging from city buildings down to humble shops. Even Catalina Island, with the exception of the city of Avalon, is included in the territory of Los Angeles County.

Because it is the first inspection system of its kind and has proved so successful in bringing up deplorable standards to those of safety and economy, Mr. Veit was asked to tell the convention-in-print of the organization and operation of Los Angeles county's electrical inspection

The town of Belvedere, unincorporated, has a population larger than most California cities, namely, 80,000 people. In fact, there are 40 unincorporated towns in the county ranging in population from 1,000 to 80,000, as previously stated.

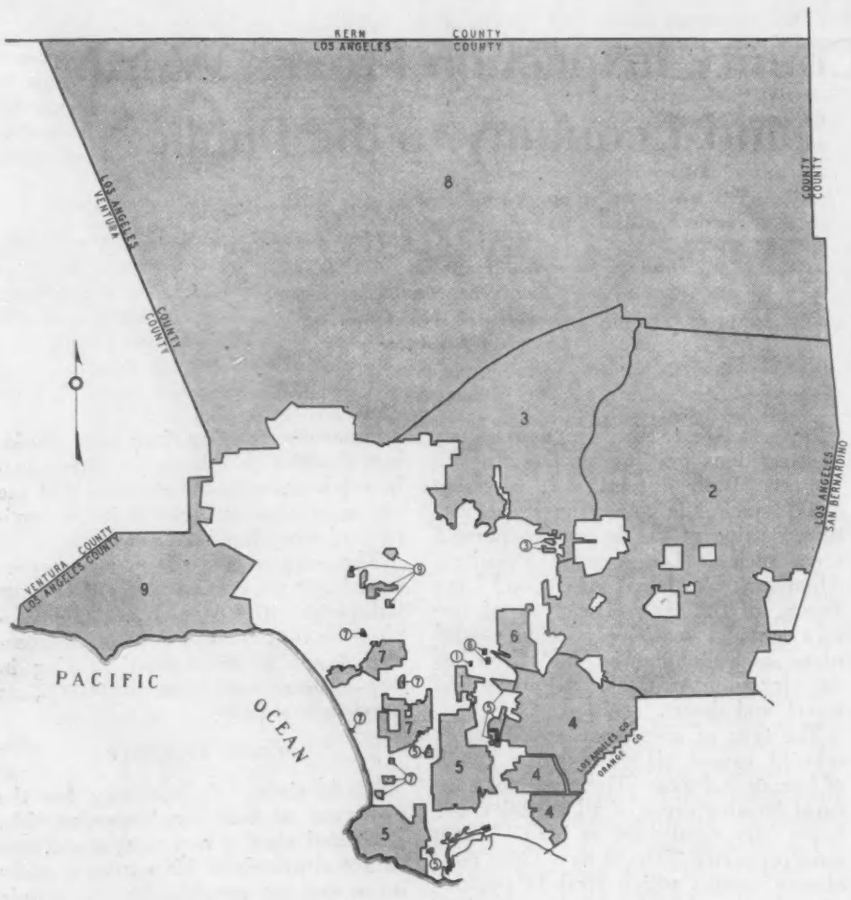
Simple Principle

In districting the territory for the operation of building inspection, Mr. Fox acted upon a very simple and fundamental principle. He wanted to make it as easy as possible for the people in the county to get quick service in the matter of building, electrical and plumbing inspection and if possible to deal with one man for the entire transaction.

First he established with the County Fire Department this principle of jurisdiction: That during construction and until a building of any kind was completed the building department would have jurisdiction. After its construction the matters of the maintenance of health, fire, safety and other factors would remain in the hands of the other divisions of the county administration.

The territory was districted more on a basis of population density than by territorial boundaries. There were nine districts created, the smallest with a territory of approximately 6 sq.mi. and a population of about 80,000 people. The largest district embraces 2,000 sq. mi. with about 42,000 population. The individual districts are based on a population of about 50,000 apiece, although this varies in each individual case.

In organizing the headquarters, Mr. Fox had under him a chief building inspector, a chief plumbing inspector and a chief electrical inspector, which position is that held by the writer. Each of us has responsibility for the inspection activities of the seventeen inspectors now employed throughout the county in the various district offices as



Map of Los Angeles County with inspection districts shown in shaded portions. The white or unshaded areas are incorporated cities. The numbers indicate to which inspection district the area is allocated

far as our own particular field of activity is concerned. We chief inspectors operate from the central office in Los Angeles where the necessary clerks and office force are maintained with a chief clerk in charge. Since the first of the year four of the inspectors previously employed have been dropped and consolidation of four districts into two has been made.

Each district office is typical. It is a small but ample sized office located in a business section and readily accessible to the entire populace of the region around that district. Each office is in charge of a district inspector who has under him the required number of assistant inspectors, ranging from one to four depending on the population and the necessities of the district. Each district also has a clerk in the office to record the necessary information and issue permits. All inspections are made and permits are issued from these district offices. All of the necessary work is done in these district offices with the exception of the central control of finances.

Each office operates as a unit within itself. To keep laison between the various offices and to provide a speedy service to the building public, two messengers made the rounds of each of these offices twice a day, once in the morning and once in the afternoon. They carry communications back and forth to the main office and bring in plans and specifications for the larger projects to be checked over by the building inspector, or electrical or plumbing inspectors as the case requires. Such plans are checked in the main office and are returned within four hours from the finish of the check so that there is no delay to the builder in this process.

To maintain effective inspection supervision the chief inspectors visit each district office one-half day each week. At set times they make inspection visits with the district inspector and aid in the interpretation of any disputed cases. Mr. Fox himself gets out to the district office once a week for general supervision, making a tour of each of the district offices.

One Man on All Inspections

The district inspectors, for several reasons, do the inspecting on all three departments of the work; that is, building, electrical and plumbing. This, according to Mr. Fox, is for the purpose of better serving the public in all respects. It means that the person intending to do building has to deal with only one man in order to get his permit and get his inspection for all the departments of his building. Centering the inspection in one man also makes for economy to the public. The men themselves are all trained engineers whom it has been possible to get because of the availability of such trained engineers during the present period.

Mr. Fox also maintains that since there was no precedent for the establishment of such an inspection organization best results were obtained by taking men who had general engineering training and fitting them for the specific job in hand, namely, that of inspecting buildings of all types in the various areas of the county.

In cities where the National Electrical Code and local ordinances have been in effect for some time it would have been necessary to take trained electrical inspectors to conduct such work. Yet in this case, where no such precedent had been established, the engineers thus trained were found to fit themselves quickly to their new responsibilities. Where any case came up requiring more intricate knowledge, one of the chief inspectors was available within a day or so to pass judgment and to remove any doubt as to the proper interpretations of the building, plumbing or electrical rules. Accordingly, at the beginning of the work, meetings were held in which the inspectors were trained. We have managed to keep them not only up to date but fully abreast of the developments in the field so that they have functioned with a fine degree of efficiency as inspectors in all of the many kinds of work they have been called upon to inspect.

It was also necessary to hold meetings of the electrical contractors in the entire territory and to acquaint them, not only with the National Electrical Code, but with the requirements which they would have to meet in the application for permits and arranging for inspection of their work. These meetings were held two or three nights a week in various parts of the county. That series of meetings has borne fruit in the way of excellent cooperation from electrical contractors everywhere.

District Variety

Maps of the districting and the location of the offices accompany this article. Briefly, the districts and the type of buildings or conditions to be expected in each is as follows:

District 1 is the heavy industrial region near Huntington Park and Vernon and includes South Gate, but not the incorporated areas of the cities named. The office is located near Compton.

District 2 is the large area west of Alhambra and Arcadia and around Monrovia and extends to the Orange County line. Besides much orange grove country it also includes the mountain area where numbers of mountain homes are built for summer occupancy. There are two branch offices, in each of which an inspector spends a part of the time. These are located at Temple and Wilmar, while the main office is at Baldwin Park.

District 3 is in the north Pasadena region and includes the region around Altadena. A branch office at Montrose operates from the main office at Altadena. Residential, agricultural and mountain conditions prevail here.

District 4 is that south of Whittier and west of Compton and runs to the Orange County line. The main office is at Bellflower and the branch office at Downey. Farming, industrial and oil field conditions are found here.

Districts 5 and 7 have now been consolidated. District 5 comprises the farming country south of Compton and west of Torrance and also the Palos Verdes estates on the coast just outside of San Pedro. In it are also numerous oil fields. District 7 includes Lennox and the beach region along the coast between Redondo and Venice. The office for this combined district is now at Lennox with branch offices at Compton and Lomita.

District 6 is one of heavy density and includes the town of Belvedere previously mentioned. Here is a heavy population center with practically city conditions, and the added complication that much of the population is Mexican and the construction cheap.

Districts 8 and 9 also have been combined. District 8 formerly covered the desert Antelope Valley with an office at Lancaster. Now this is served out of the District 9 office at West Hollywood which covers several islands of unincorporated territory in Beverly Hills, the Malibu coast up to the Ventura County line and with the addition of Antelope Valley a large desert area to the north reaching to the Kern County line. The latter is covered on two days a week by a man from the West Hollywood office making inspections in the Antelope Valley district out of Lancaster and Palmdale.

A complete tour of the entire district offices by automobile from the main office in Los Angeles requires a run of 170 miles, not including the branch offices.

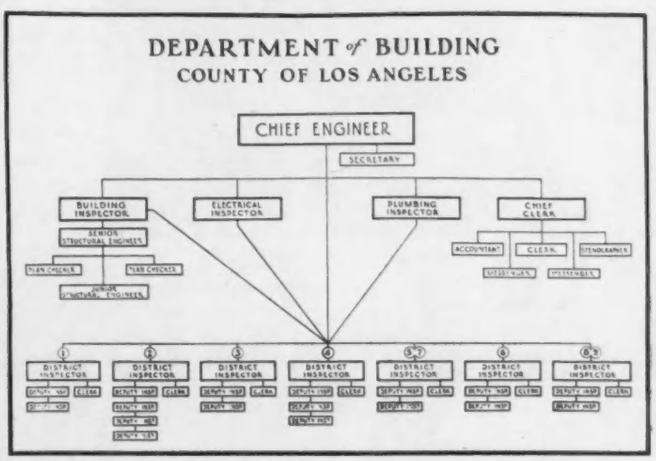
Inspection forms and applications for permits have been standardized. The building permit is on white paper, electrical on green, the plumbing on pink. Each of the permits contains the necessary information for the class of work it covers. On the electrical application, aside from the standard listing of district, job and permit numbers and time for first inspection and information relative to the address, there is space for noting the nature of the installation and a description of the number of outlets and circuits and their location by rooms. A copy of this is illustrated herewith.

According to the inspectors, one of the hardest things to get from a prospective builder is the exact description of the location of his house. In incorporated cities, numbers and streets are established things, but in the county very vague general descriptions of the locations of a house are one of the many problems which face the inspector. Nevertheless, the entire department prides itself on the fact that no customer has to wait more than 24 hours for an inspection.

Low Cost Operation

Mr. Fox is particularly proud also of the cost record for the first year of operation. He has made a comparison of the costs of his inspection work with costs of other cities in southern California. The county inspection compares very favorably with those of other more concentrated regions where the costs of travel and the problems are much simpler.

Chart showing organization of the county building department



Form used in applying for electrical permit. Note the completeness of information asked

DEPARTMENT OF BUILDING
COUNTY OF LOS ANGELES

APPLICATION FOR PERMIT
ELECTRIC

NATURE OF INSTALLATION: WIRING, FIXTURES, SERVICE, RANGE, HEATER, POWER, SIGNS, MISCELLANEOUS

DISTRICT No. | JOB No. | PERMIT No.
READY FOR FIRST INSPECTION | RECEIVED BY | DATE ISSUED

APPLICANT FILL IN HEAVILY OUTLINED PORTION ONLY

ELECTRICIAN: NAME, ADDRESS, CITY, TEL. NO., STATE LICENSE NO., COUNTY REG. NO.

JOB ADDRESS, LOCALITY, NEAREST CROSS ST.

OWNER: NAME, MAIL ADDRESS, CITY, TEL. NO.

DESCRIPTION OF WORK
NUMBER OF OUTLETS ON CIRCUITS
LOCATION BY ROOMS

CIRCUIT	LIGHT OUTLETS A	B	C	D	E	SW	PLUGS F	G	H	FIXT
LIVING ROOM										
DINING ROOM										
BKFST. RM.										
BATH										
ENT. HALL										
HALL No.										
FRONT PORCH										
OUTSIDE										
KITCHEN										
SERV. PCH.										
BDRM. NO.										
CLOSET										
BDRM. NO.										
CLOSET										
TOTAL										

CORRECTIONS

ORIGINAL

		$
NO. OF OUTLETS		$
NO. OF FIXTURES		$
NO. OF MOTORS	H. P.	$
NO. OF SIGNS	TRANS.	$
NO. OF RANGES OR HEATERS		$
MISCELLANEOUS		$
PERMIT FEE		$
TOTAL FEE		$

APPROVED

	INSPECTOR'S NAME	DATE
CONDUIT		
WIRING		
FIXTURES		
POWER		
UTILITY CO. NOTIFIED		
FINAL		

In 1934 the cost per capita for the building department for the city of Los Angeles was 32 cents, on a population estimate of 1,238,045 and an estimated assessed valuation of $1,765,451,250. There were 98 men in the building department and the territory covered was 450 sq. mi. For the county of Los Angeles, outside of the incorporated cities, the cost per capita was 29 cents for a population of 371,400 and an assessed valuation of $258,404,466. The staff included 40 men and the total area is 3,300 sq. mi.

Still further comparisons were made with Pasadena where the cost was 24 cents per capita with a population of 76,086 and an assessed valuation of $168,061,405. Pasadena had 6 men in the building department and its area was 20 sq. mi.

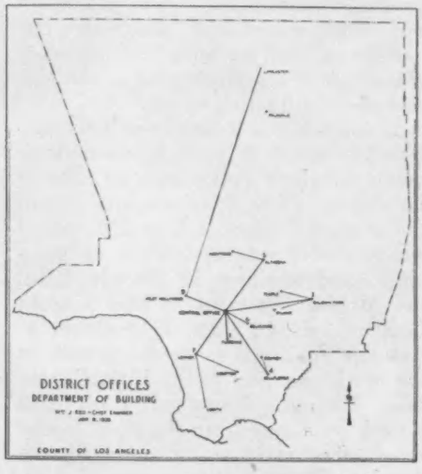
Beverly Hills had a much higher rate of 60 cents per capita with a population of 17,429, an estimated valuation of $66,742,100 and a staff of 4 men, and a 5-mile area.

Glendale's cost was 32 cents per capita with a population of 62,736, an assessed valuation of $74,225,530 and 4½ men on the staff. Its area is 9 sq. mi. Santa Monica had a 27-cent-per-capita cost for a population of 37,146, with an assessed valuation of $61,705,570. Five men were on the staff and the area is 8 sq. mi.

Since the first of the year four men have been dropped, as previously stated, so the showing should be better this year than last. The permits, receipts and number of inspections have increased 40 per cent since the first of the year and right now, according to Mr. Fox, in terms of revenue and permits, building in the county is 40 per cent of the volume for the city of Los Angeles despite the fact that the county has less than one-third of the city's population.

The mileage covered by inspectors in February of 1935 totaled 10,035 miles. During that period 5,964 inspections were made, an average of 1.7 miles per inspection. Last year the miles per inspection averaged 2.5. This year shows an improvement in this respect.

The scale of fees is very low in the electrical division. It is 75 cents for a permit and 5 cents per electrical outlet, with switches counted as outlets. Mr. Fox estimates that the revenues produced about 50 per cent of the cost of operating the department last year, which is a better proportion than most cities and counties. The average for the cities of the nation runs about 50 per cent, he pointed out, and this year he hopes that about 70 per cent of the cost of operating the department will be derived from the revenues from fees and permits.



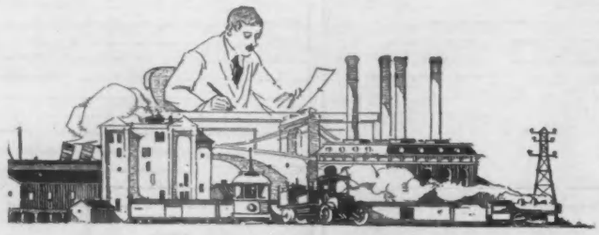
County map showing location of main and branch offices

"This is as high as we expect to go," said Mr. Fox, pointing out that "the total cost of inspection should not be borne by the builder alone since the public enjoys the protection which a safe installation gives to the neighborhood." In supporting the department partly through taxes the property owners or the community as a whole pays for the benefits it receives and shares this expense with the new home builder.

Simplicity Is Keynote

Nowhere else in the West, at least, is there a comparable organization for county inspection. Perhaps Los Angeles County is unique in many respects and the conditions here are such that the experience is of small value to other regions. However, there are certain definite lessons that have been learned which can guide other counties either in California or other states of the West in the operation of a county inspection system. These lessons point to a simple organization, centering as much responsibility as possible in each local division point, and providing from headquarters guidance and supervision and relief from responsibility on any intricate interpretation or controversial issue which may arise from differences of opinion between the local inspector and any particular building interest.

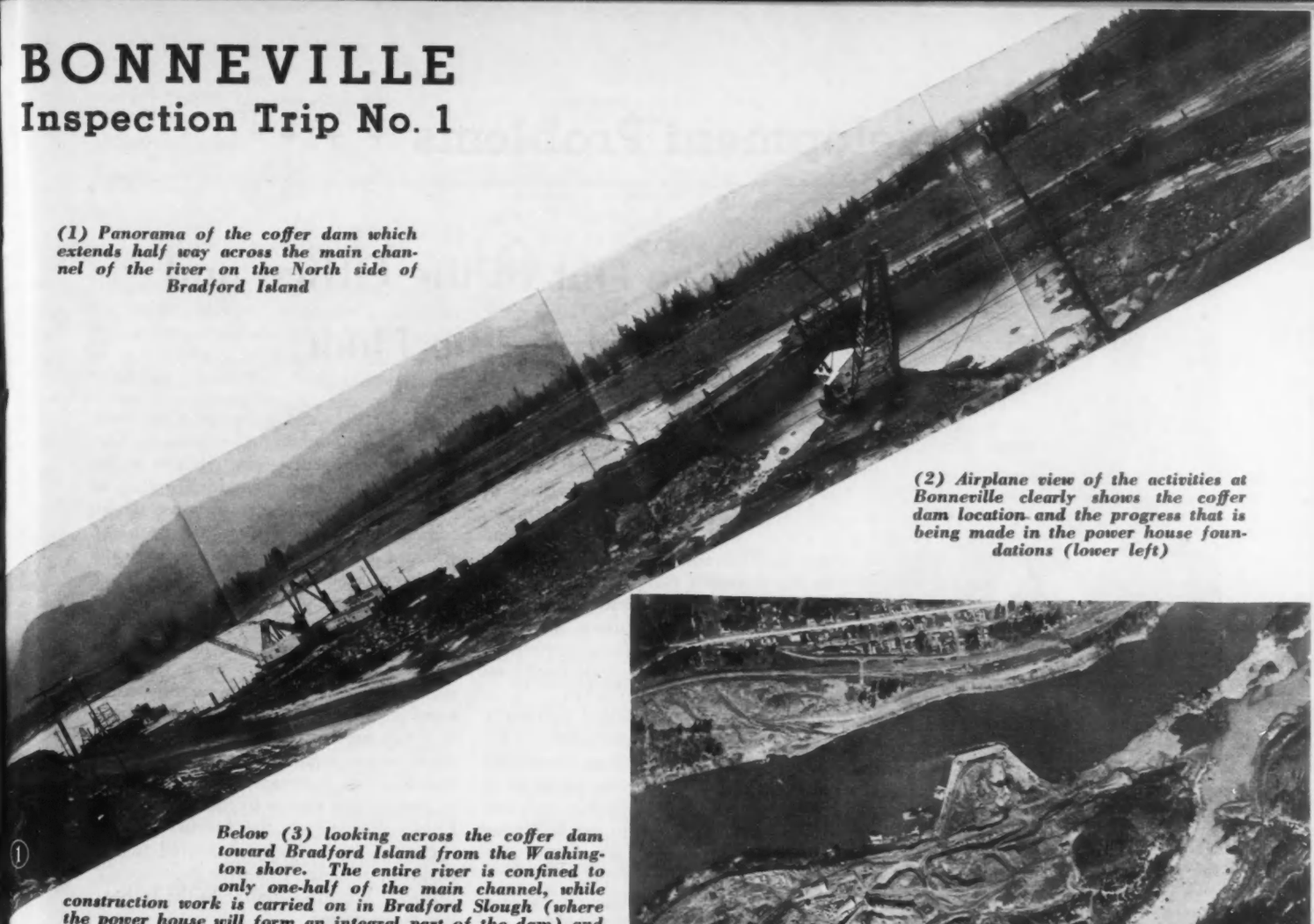
And if anyone should ask me whether the conditions that I found when I first started this work would lead me to feel that there was a definite need for inspection of electric wiring in all types of buildings that are built outside of incorporated areas, I should most emphatically say yes. The earthquake which shook down the walls of many buildings revealed the flimsiest and most hazardous types of makeshift wiring. Our inspections since have brought to light unbelievable conditions. In districts where fire protection is meager certainly the basic installation should be such as to preclude any chance of fire. To the electrical industry county inspection has meant a much better class of construction, and far greater adequacy to the customer. Everyone has benefitted from this work.



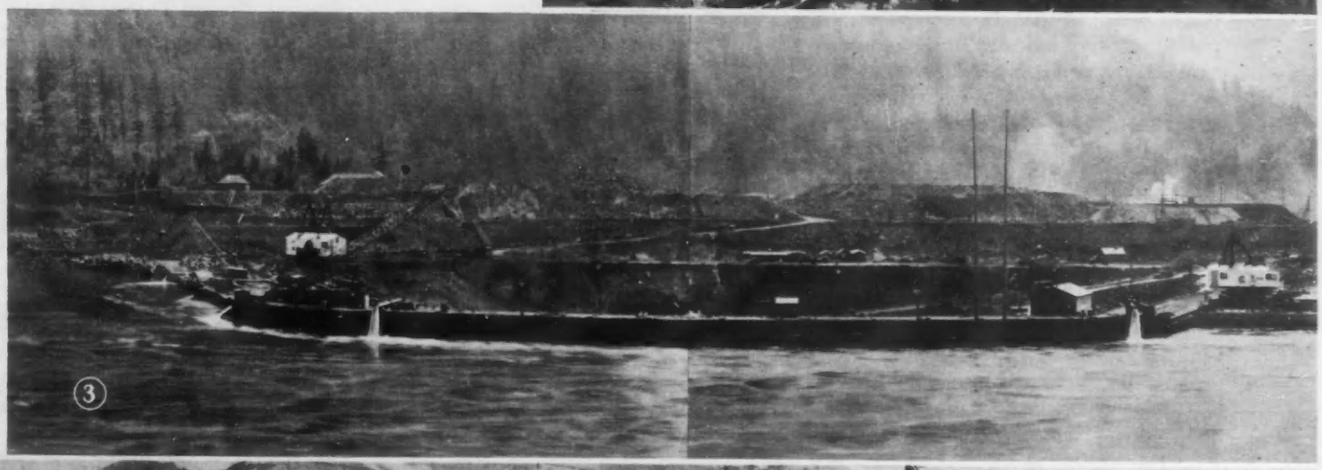
BONNEVILLE
Inspection Trip No. 1

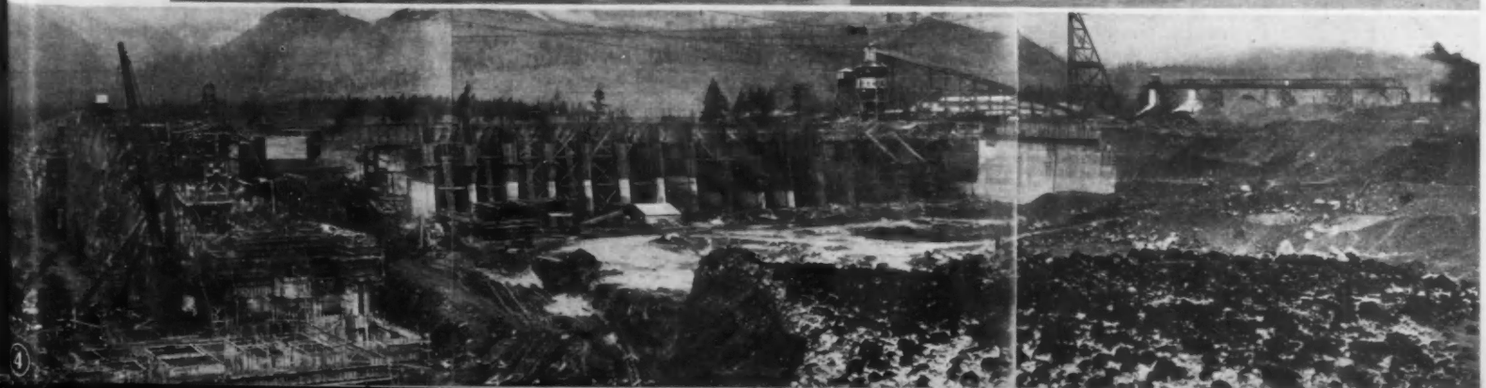
(1) Panorama of the coffer dam which extends half way across the main channel of the river on the North side of Bradford Island

(2) Airplane view of the activities at Bonneville clearly shows the coffer dam location and the progress that is being made in the power house foundations (lower left)



Below (3) looking across the coffer dam toward Bradford Island from the Washington shore. The entire river is confined to only one-half of the main channel, while construction work is carried on in Bradford Slough (where the power house will form an integral part of the dam) and in the coffer dam where one-half of the main dam will be completed. Later the river will be diverted through the power house works while the other half of the dam across the main channel is completed. (4) Panorama looking downstream from the Oregon side at the power house foundations. At the left is the excavation for the ship canal locks around the dam





Come Out of the Office and On to the Floor

By H. A. LOTT
Operating Dept., Southern California Edison Co., Ltd., Alhambra, Calif.

THE fact that "public relations" or "customer goodwill" is recognized as one of the industry's major problems for 1935 indicates that the efforts so far spent on its solution have not been entirely successful. The need for the best "customer goodwill", and the fact that the contact man is accepted by the public as the industry, are conceded truisms which need no further discussion. In this paper we shall confine our efforts to a discussion indicating the necessity for a study to determine just where our greatest weakness is located and some observations by the writer intended to indicate that better "public relations" could be obtained if our field personnel was better trained and some of our business methods changed to better fit the public convenience.

When technical and mechanical problems which have to do with the generation and distribution of energy are under consideration a rather extensive investigation is usually conducted to determine the urgency of the solution. A thorough understanding of the problem at hand is a necessary preface to an intelligent solution. As far as we have been able to determine no general data has been assembled to help us determine the greatest weakness which has to be overcome in order that our public relations may be improved. Isolated examples unfortunately sometimes give us an entirely incorrect perspective of a problem. A few outstanding examples of either good or bad are apt to influence us to disadvantage. It appears to the writer that a comprehensive survey should be made in order that the perspective may be made more clear and our points of weakness emphasized. With our weakness exposed a solution to our problem should follow.

Two methods for semi-scientifically studying our problem are presented for consideration. First let us circularize our employees, and get the opinions of everyone in our industry. Let each employee submit answers to the following or similar questions, typed and unsigned in a sealed envelope.

A. What is the most common complaint that you hear against your company's—

1 service,

2 rates,

3 general business procedure.

B. Give a suggestion on a method or change in the rules of your job which would assist you more tactfully to deal with the public.

C. When were you last instructed by your superior in methods to use when dealing with the public?

The answers should then be compiled in order that the more common complaints can be compared in the order of their frequency. The results will be instructive, interesting, and we promise you that the answers to the last question will be rather startling.

Second, let us ask the customer's help. This method will probably not meet with great favor but is used by leading hotels and transportation companies throughout the country. The greatest argument against its use is the rather limited response which would be obtained. Again a large response might indicate the seriousness of the problem while a small response might indicate a lack of resentment and general satisfaction. The correct interpretation of the response would be a great aid in solving the problem. The fact that this investigation might stir up a dormant condition or cause unfavorable comment merits grave consideration. However, we need to know more accurately what is our standing with the general public. Our managers should be able to present the matter to the public tactfully. We submit the following as a suggested folder to be delivered to the customer at same time with the monthly billing. Wording similar to the following is suggested.

Name of Company

It is our constant endeavor to give you the best possible service at the lowest rates economically possible. We appreciate your patronage and hope to continue to serve you to our mutual advantage. We ask your cooperation in order that we may more fully determine if our service is entirely satisfactory to you. Do you need any additional service? Would you care to have one of our representatives call on you and advise you on the purchase of electric cooking, water heating, refrigeration, more lighting or any other electrical convenience? Are our employees always polite? Is there any method that you can suggest which would improve our service to you? Please leave this slip at one of our offices or enclose it with your bill. Write your answer on the back. You can help us to serve you and your suggestions are always appreciated.

President.

The compilation of this data should also reveal some weakness. Comparing it with the employee reports should give us a better view of our difficulty. With the problem thus presented we will have a better understanding of public relations. The entire problem is so complicated by generalities, so colored by personal opinions engendered by contact with certain good and evil examples that an investigation should be of incalculable advantage to every utility. Possibly we are too worried. The

Public Relations

The prize winning paper on the best answer to the general problem: "What are the Most Effective Methods of Increasing Customer Goodwill?"

general public may be generally satisfied and we are blinded by the thunder of the politician. Let us find out, then we will know what to do. Also, the folder might bring in a little new business.

Out of the Office

In discussing a more specific remedy for unsatisfactory customer goodwill the writer is handicapped by the lack of a definite knowledge of the main weakness. This has been pointed out in the first part of this paper. We must rely on observations and remembered experience. Our experience as local manager in a small California community is still vivid. Residence rates were fifteen cents per kilowatt hour. Gas was $1.50 for the first 500 cu. ft., thereafter scaled according to consumption. We still barely made expenses. Taxes, freight charges on oil for generation of gas and electricity and small demand set the rates. Withal our "relations" were not bad. Self preservation gave us a tact and politeness of manner which we could hardly equal under other conditions, and tact comes hard when the thermometer reads 125 in the shade, if you can find any shade. So we are very interested in this problem of better public relations.

It appears that we have arrived at a point in handling our customers which is quite similar to a place arrived at in the problem of industrial accident prevention several years ago. As to the latter we agreed that accidents could and should be decreased in number. Literature was prepared, instructions were given, accident prevention was discussed but serious accidents continued to occur with alarming regularity. The vital spark necessary to make the problem into a living entity was missing. Finally we came to life, the "boss" took over the job and "accident prevention" moved from the office into the field. Men trained in accident prevention methods worked in the field, supervised jobs, held instruction meetings, and in general taught by precept and example the thoughts and methods of Safety First. The missing spark was thus applied and accidents began to decrease. Perfection probably never will be reached. We continue to strive for it. Our effort to this end keeps the problem alive.

The problem of making and retaining customer goodwill seems to be in a similar state of inaction. Literature has been prepared, we are deluged with statistics and facts concerning our industry and individual company, good public relations are discussed, the necessity for customer goodwill is stressed but we are not in action. Public relations are still in the office. Some action is necessary to move them to the counter and on the service truck.

The same treatment which put the spark of life in our safety programs could well be applied to our customer problem. Men and women trained and particularly fitted for the job should instruct our personnel in courtesy, should work on the job with them teaching methods for creating goodwill by precept and example. Instruction meetings where problem cases are presented and worked out to a correct logical conclusion are helpful.

This paper suggests—

1. ***An employee survey of customer complaints about the company***
2. ***A customer survey to find out to what extent dissatisfaction exists***
3. ***That the manager vitalize public relations by spending some time on the counter, giving example to employees and meeting the customers, just as in a department store***
4. ***That it be made easy for customers to start using service***
5. ***That little, personal things be done to make the company easier to do business with—and more human***

Boss Sets Example

In this connection we note a marked difference between the commercial establishment and the utility office. In our commercial house we find the owner or manager spends a portion of each day in the store meeting the customer and teaching his clerks salesmanship and courteous treatment.

In the utility office the manager is difficult to approach. Bulwarked behind partitions and desks an appointment is necessary before he can be contacted. We believe our local managers could emulate the store proprietors' example to good advantage. A portion of each day spent at the counter, collecting, answering complaints and teaching courteous and expeditious customer relationship should put more life in the entire organization.

In this day of utility baiting it is essential that our managers get to know the public. City officials, luncheon club associates, local politicians and large wholesale consumers are considered essential people to know and upon them the bulk of our manager's persuasion is used. We should, however, consider that the general public pays the greatest revenue, needs more new appliances and casts the majority of votes. The easiest way to meet the general public is at the counter. We are a peculiar people and the occasional vanity tickling glow which some of us would receive while being waited on by the manager would pay dividends in better customer goodwill. The opportunity afforded the employee to observe the manager, who should be a specialist in promoting goodwill, would be of great value. The manager would have an opportunity more closely to observe the employees reactions to different problems and be in a better position to offer constructive advice when needed.

The thorough training, the one which puts life in our organization is a perpetual thing. It reoccurs every day. The rush hour is on. Our cashier is a little tired and the business of receiving payments is becoming mechanical. Hardly a word is spoken. A line is forming, when the manager steps up to teach and help. The manager glances at the first receipt and says, "Good morning Mrs. Smith." Other conversations may follow but the routine is broken. A little life has been injected into the monotony of collections.

There is a strange reaction to this custom of calling a person by name. We always like a place where the employee calls us by name. When we make a second or third visit to the dentist or doctor and are received in silence we occasionally hunt another. Possibly the bill may be a few cents higher but the butcher and grocer who call us by name get the trade. They have better "public relations".

Utility offices have a big advantage in this respect. The name is usually printed right on the bill. If we are not sure we say, "Are you Mrs. Jones?" These are many little niceties of conversation and tactful methods to be used when dealing with the public. The managers and certain other employees have these methods in hand. Let us move them out of the office and put them on the counter occasionally in order that our contact employees may get the benefit of their greater knowledge and experience.

Technically and mechanically we are an industry whose greatest precedent

is to shatter precedent and tradition. Yet in our business offices we observe methods in use which have been traditions for years. Can it be that these methods are so excellent that better can not be found? When our study is compiled and our points of weakness are revealed we will be confronted by certain methods which conflict with the suggested remedy. Can we follow the lead of the technician and adapt our ideas to meet conditions.

Being semi-monopolistic our business allows us to follow methods which would not be possible were we in a keenly competitive field. Our customers would perhaps be better served if competition necessitated changes which made it easier to secure our service. Some time ago our technical papers contained articles on the apparent success which favored some experiments that had been made. Why not try some of them on the Pacific coast.

For example, we have one occasionally distressing custom which requires a prospective customer, whether for light, gas, water or telephone, to present himself to the local office to arrange for service. It apparently makes little difference whether it is an entirely new consumer or one from another community served by the same utility. He still must personally appear at the office to complete the formality of applying for service. It is hard to understand the necessity for this procedure.

One of the angriest consumers we ever encountered ran against this irrevocable precedent. He swore by the eternal "bow-wows" to fix all utilities who do business that way. Imagine his embarrassment when and if he is ever served by a municipal bureau and has to follow the same procedure. It would appear that the only barrier preventing the on-and-off man from enrolling the prospective customer for utility service is a matter of training for this additional duty. We have only to hint the need for a new car or more insurance to receive attention plus, from businesses supplying these services. The contrast between the utility and the keenly competitive business does not impress the customer in the utilities' favor.

We read of one utility business where a card was hung to the disconnected meter that gave instructions for connecting service. The card was to be mailed when the house was occupied and a company representative would later call to complete the transaction. Our memory recalls a more recent meter in an empty house. Warning against tampering, fine and imprisonment, call at nearest company office, was this card's message. We wonder if this particular gas utility does not lose much in goodwill as a result of such blunt warning. Of course there is a safety factor here which does not apply to electrical service to most premises. Why not ease our connection procedure and gain a few friends?

Little Things That Count

There are several other methods used which we believe should receive some careful reconsideration. Briefly they are as follows:

Only a limited few assist in collections. We learned to stand in line during the war but are becoming a little tired of it. The vision of several customers standing in line while a single cashier receipts our bills is not conductive to good feeling. Particularly it is so when we observe several employees who do not appear to be so occupied as to prevent their assisting in collections. We know nothing about cash, business methods or bonding of employees, a little action is what we want under such circumstances. We just are not interested in reasons why it cannot be remedied; we are just tired of standing in line.

At the bank, the so-called impersonal temple of business, we find a sign whereon is printed the name of the man or woman who is completing our transaction. Occasionally we find such cards in the utility offices. Usually it is absent. We should use it more. One likes to know the name of the person with whom he is conducting his business.

We might go on and enumerate some examples to illustrate poor public relations. However, it should not be necessary, we all know of some cases. Each such case is a fatal accident to customer goodwill. Our greatest problem is probably that of more thorough training. When each employee becomes public relations conscious and each day strives to improve his tact and judgment when dealing with the public an improvement in customer goodwill should result.

So in conclusion let us decide to study the situation a little more thoroughly; ask our employees and our customers to tell us where our weakness lies, and then apply the same technical analysis to the individual problems which cause our friction as has been applied to the mechanical problems of the industry. Let us train our personnel more thoroughly, get everyone public relations conscious, and the problem will cease to be one of major proportion.

"Every Employee a Salesman" Will Build Domestic Load

By HOWARD H. BULLOCK
Sales Department, General Electric Co.
Los Angeles, Calif.

A NEW industry is in the making—"The Home Electric." Its success and growth will be our good fortune.

The depression has wrought many hardships upon the citizens of this nation, but along with the calamities and uncertainties, it has also brought a great blessing. It has taught our people that their future must be built on security and not on vague hopes of becoming rich over night by speculation on propositions that are basically unsound from an economic standpoint. This security is to be found in owning a home, built and equipped to give comfort and conveniences in keeping with the times.

By setting up the National Housing Act, the Government has opened the way for citizens to borrow money on one long-term, low-interest rate, amortized note, payable like rent over a period of from ten to twenty years. The National Housing Act was set up primarily to help the distressed building industry, which is the second largest industry in our country. The next move is up to the building material manufacturers, of which the electrical industry has become a major factor. Here is our opportunity to increase the domestic use of electricity. It behooves every manufacturer of electrical utilities and appliances to support the National Housing Act to assure his own success.

Off Peak Rates

For many years the public utilities have looked upon the domestic load as less desirable than the industrial load,

since the industrial load consists principally of large industrial customers who purchase large amounts of power, which results in a well-balanced load throughout the entire day. On the other hand, until recent years the domestic load has been primarily a lighting load between the hours of 5 p.m. and 12 p.m. However, since present industrial plants cannot possibly consume the great abundance of power now available and to be available upon completion of Boulder Dam and other large projects throughout the country, public utilities will be faced with the difficult problem of finding an outlet for this available power at a legitimate profit to themselves.

Many new appliances have been placed on the market by electrical manufacturers during the last few years; such as electric ranges, refrigerators, washing machines, ironers, kitchen mixers, air conditioning equipment for both heating and cooling, and other motor driven devices for use in the home with these it is possible for the utilities to have, not only a short hour peak load on the domestic distribution system, but likewise a steady demand and a desirable load from a power factor standpoint, since it is almost an unity power factor load throughout the biggest portion of the 24-hour day.

Of the various appliances and equipment now in daily use in homes throughout the country, the most recent addition is air conditioning apparatus with such great possibilities that it will probably become the "big brother" of the group. In most cases there is no question but that the utilities will benefit from air conditioning installations. However, unless aggressive steps are taken, the only part of the air conditioning load which the electric utilities shall acquire will be on the cooling part of the equipment, namely, the motor drive. It is here that the electric utility has one of its greatest opportunities for increasing the domestic load during the present off-peak time, by setting up a desirable rate between the hours of, say, 11 p.m. and 6 a.m. for electric heating and giving the domestic user the benefit of this power at a very low rate.

The question arises, what type of electric heaters would be used? For instance, there are the radiant, convection, and contact types of electric heaters, yet these types, if used for domestic purposes, probably would be on and off the line controlled by time clocks and thermostats between the hours of 6 a.m. and 10 p.m., which would not take advantage of the off-peak load period. Therefore, it would be unprofitable for the utilities to reduce power rates appreciably between these particular hours in order to make electric heating competitive with other forms of heating now available.

In the writer's opinion, the utilities and manufacturers of electrical equipment should encourage the off-peak electrical thermal storage system. A method of electrical heating utilizing the thermal storage principle permits taking energy from the power lines at off-peak periods when the energy can be sold at the lowest price. On this basis, rates of 1c or less per kilowatt-hour can be established during off-peak periods, thus making electrical heating compare in favorable light with other types of heating, at the same time permitting utilities to dispose of off-peak power at a profit which they would not otherwise realize.

This system of heating is particularly feasible in such mild climates as experienced in southern California, and it presents a good outlet for the large blocks of power which will be available shortly. The only disadvantage it has at present is its initial installation cost, but the manufacturer surely can solve this portion of the problem.

My reason for emphasizing this one phase of the domestic load is to point out the possibilities of a more balanced domestic load throughout the 24-hour day.

ARCHITECTS' SCHOOL

To take advantage of the new residential building campaign sponsored by the National Housing Act, it will be necessary for the electrical industry to put on an educational campaign. First, it will be necessary that architects, engineers and building contractors be properly educated as to what constitutes a modern electrified home.

The average architect is primarily interested in the architectural design and structure of his building, and he gives but little thought to the electric system, which is so important a factor in the building of today. He is satisfied to take specifications written perhaps several years ago and now entirely inadequate and out-of-date.

Domestic Electrification

First prize winning paper in answer to the problem, "What are the Most Effective Methods of Increasing Domestic Use of Electricity?"

HOWARD L. BULLOCK

Such an educational campaign, among architects, engineers and building contractors may be accomplished in any one of several ways, but it is my belief that a free educational course, called "Electrifying Our Homes" could effectively instruct this group.

This course could be covered by five or six lectures given by effective speakers. The first would cover the subject of "Power Rates." It could be very clearly pointed out just what is meant by the rate schedule, explaining the possibilities and advantages of using the off-peak load for air and hot water heating. The second lecture might cover "Wiring Systems" when it might be forcibly pointed out that the proper electrical system should be installed in every home, if it is to be modern. In this electric system there should be a sufficient number of outlets, with proper capacity, for the necessary floor lamps, radios, electric clocks, heating pads, etc. in every room of the house. Convenient outlets in the kitchen and service porch to take care of the various motor-operated devices for sale on the market today are most essential.

The third lecture might deal with "Illumination" both interior and exterior, pointing out the advantages of various methods of lighting, and how lamps and fixtures should be arranged in order to have the proper foot-candle intensities in each room.

The fourth paper might be completely devoted to the "Electric Kitchen."

The fifth paper could very well cover "Air Conditioning—Both Heating and

Cooling." Most certainly architects, engineers and contractors have a good deal to learn in this particular field in its application to residences, since air conditioning as yet is in its infancy.

The sixth and final lecture might be devoted to general motor-driven devices, such as washing machines, ironers, mixers, wood-working machines and motor-operated tools which are coming more and more into general use in homes.

This suggested course in "Electrifying our Homes" should be sponsored by the electrical manufacturers and utilities and certainly should receive the moral support of architects, engineers and contractors, as well as the various committees of the National Housing Act. Each registered attendant to the course should submit a complete set of electrical specifications at the completion of the lectures, covering a small electrified home, at which time a prize such as an electric range or refrigerator could be awarded to the author of the best set of specifications. Also, at the completion of the course, the electrical industry should submit to each architect, engineer and building contractor the complete set of five or six lectures on the modern electrified home for his future reference and guidance.

If this educational campaign proves successful and the new homes under construction are equipped for all of the modern electrical conveniences of today, a desire will be created among present home owners and renters to have the same conveniences in their homes, thus further increasing the electrical manufacturers' business and adding to the electric utilities' domestic load.

Every Employee A Salesman

The electric utility organizations go to considerable expense in aiding the electrical manufacturer to promote the sale of equipment, their only reward in a good many cases being the additional connected load. However, in order for electric utilities to compete successfully with gas utilities, it seems reasonable that electric utilities should be in a position to merchandise electrical appliance in the same manner as that of the gas utilities at the present time.

For example, in spite of the last two years of the depression, domestic refrigerator and range sales have been increasing. I wonder if electrical manufacturers and utilities have properly coordinated their efforts to see that the proper percentage of refrigerators and ranges installed were electric?

In daily conversation with architects, builders, and people in other walks of life, there is one thing that has been forcibly brought to my attention. This is, that the gas companies and associations have been doing a good job of selling. Gas refrigerator sales have increased tremendously in southern California in the past two years. Why? Because the gas industry, both utility and manufacturer, have co-ordinated their sales efforts. Gas utility organizations have actually merchandised refrigerators which are to go on their lines, and in doing this, they have made every service, factory, and office employee a salesman, educated to talk gas refrigeration and cooking to friends, relatives, and patrons, and to point out that gas refrigeration costs less than electric. This psychology has sold many gas refrierators that should have been electric.

This paper suggests—

1. ***Full use of National Housing Act financing***
2. ***Off-peak rates for storage water and house heating systems***
3. ***An architects' school to instruct in the needs of modern home electrification***
4. ***Every employee in the industry becoming a salesman for domestic appliance use***
5. ***Enlisting the support of home financing institutions to demand electrification of premises on which loans for building or remodeling are made***

The electrical industry can overcome this problem with practically the same method; that is, if any employee of an electrical utility or manufacturer is approached to discuss rates, he should take the offensive immediately and be able to point out that continuity of service, cleanliness, safety, and convenience of electricity is very inexpensive, when considered with the many advantages of electrical appliances offered to the domestic user of today.

The thing we must do, each and every one of us in the electrical industry, is to become a salesman. Instead of talking about high and unfair power rates, it is our duty to the industry and to ourselves to point out the advantages of electric service and the many wonderful electrical appliances available for domestic use today.

Educate the Financier

With the National Housing Act, there must be a financial institution to produce the money or make the loan. As the financial end of this Housing Act is being taken care of by various banking, building, loan and insurance companies, the electrical utility and manufacturer should not overlook these institutions. In other words, utilities should get a story across to the financial institutions to the effect that when the latter are making a loan for a new residence or for remodeling an old residence, they should insist that the borrower spend a definite amount of the loan in securing a modern and properly installed electrical system. If this is done, it will not only be to the advantage of the electrical industry, but will also be to the advantage of the financial institutions making the loans, as the house will have a greater resale value and bring in higher rental.

How can this be done? It is generally known that banking institutions, insurance, and building and loan companies are very desirous of knowing exactly for what they are loaning their money. This might be carried on through co-ordination of efforts of the construction industries' committee of the various Chambers of Commerce throughout the country and the various committees of the National Housing Act, and then be elaborated upon by manufacturers and utilities in the locality, since these concerns already have certain financial connections with the banking, insurance and financial institutions.

The electrical industry has a great opportunity to increase the domestic load. Will it sieze this opportunity? I am sure it will, but in order to do so it must first investigate the power rates to encourage domestic users to utilize the off-peak power at very low rates, which at the same time wil benefit the utilities by new profits which they are not collecting today.

Second; by properly educating architects, engineers, building contractors and electricians to design and build homes that are electrically modern, a desire will be created among present home owners and renters likewise to have homes that are electrically modern.

Third; the utilities and electrical manufacturers must co-ordinate their efforts in distributing and selling electrical appliances by making every member of an electrical organization an

electrical appliance salesman.

Fourth; it is up to the electrical industry to sell the financial institutions that it is to their best advantage to see that the money they lend for home construction is properly spent, and that a certain portion of that money should be expended to make these homes electrically modern, at the same time making their investment more secure.

If this procedure is followed out, the domestic user will be the utility's best customer. Furthermore, the success of the program will open up a large market for the electrical manufacturer's appliances.

PAUL H. YELTON

Commercial, Industrial, Agricultural Markets Best for Surplus Power

By PAUL H. YELTON
Superintendent, Southern Sierras Power Co., Victorville, Calif.

IN the early days of the electric utility industry the problems were largely of an engineering, construction and operating nature. While these phases of activity are none the less important today, their fundamental principles have been generally worked out. Actual installed generating and transmission capacity are in excess of present requirements and will soon be increased greatly by government installed hydro plants. This situation has created a commercial problem which overshadows all others—the need of finding a market for the surplus power. The greatest possibilities of selling large quantities of power are for commercial, industrial and agricultural use.

In view of the large surplus capacity to be available there is some talk of getting away from demand clauses in schedules in order to sell kilowatt-hours during the present emergency. This fundamental principle of rate-making should not be overlooked, however, as the time will come when load will be developed to the point where peak demands will again tax system capacities. Regardless of the additional power to be available, system load curves must be studied and an effort made to add load to the best advantage. It is possible that on account of the low rate on secondary power from the Hoover Dam even lower rates can be made for off-peak power.

Considering load in a general way we should make every effort to:

1. Hold all existing business.
2. Displace competitive power.
3. Get all new business.
4. Develop more use by existing consumers.

Frequent contact with all large consumers keeps us in their minds and we are then in a position to know when any questions arise which might mean loss of confidence or business. There must be sufficient personnel in each district to maintain these contacts.

The electric utilities must cooperate with electric manufacturers, universities and consumers in conducting research and experimental work along all lines tending toward the further application of electric service.

Commercial Load Building

Customers are attracted to a well lighted place, are comfortable and relaxed while transacting business and leave with a sense of satisfaction. Commercial consumers of all kinds should be shown examples which would prove conclusively that good lighting is one of the best forms of advertising.

Financing of the increased wiring facilities and fixtures presents a problem.

Power Uses

First prize winning answer to the problem: "What Are the Most Effective Methods of Increasing the Commercial, Industrial and Agricultural Uses of Electricity?"

Just at the present time full use should be made of the federal loan agencies which are available for such improvements. Everyone connected with the electrical industry should see that the provisions of these loans are known to all who might possibly make use of them.

Heavy duty commercial appliances are not pushed by the utilities or, for that matter, not very aggressively by the dealers. There is a big field here in electric cooking, water heating, refrigeration, etc. Again the matter of financing the cost of equipment and installation will have to be worked out. Certain utilities are now financing domestic appliances over a period of years. This principle might be applied to commercial equipment very profitably.

One of the biggest possibilities of load building in commercial establishments is the working out of a single meter rate. This could be done by the use of a demand meter; making a simple block schedule based on kilowatt demand. A schedule based upon connected load is not satisfactory, as it is impossible to maintain an accurate check on the consumer's equipment.

A commercial consumer may now have four separate meters: light, sign light, heat and power. The lighting rate is highest, the sign light considerably less and the heat still lower. The power rate will vary with the size of the installation. There are no doubt many consumers who have some lights connected on the lower rate circuits and this is difficult to prevent. A single meter rate would mean lower wiring costs for installations as different types of service could be connected on the same circuit. By watching the demand a lower average rate could be earned with resulting greater use of electricity. Such a rate would tend to give a better load factor from these consumers. They could even install load-limiting devices to keep down their demand.

In this connection a low water heating rate could be earned by the use of a load-limiter to cut off the water heater when a certain demand is reached. Large insulated hot water tanks could be provided for heating during the night off-peak period. By the installation of a clock-controlled switch this current might be sold on an unmetered rate, based upon the size of the tank and the wattage of the unit. Then during the day this heating unit or a higher wattage heater could be used in connection with a load-limiter on the regular rate.

The present widespread talk of government ownership of electric utilities has started people generally to thinking electrically and the feeling is that rates will be cut in the near future. This trend of thought can be turned to our advantage if handled properly as no one investing in new equipment should buy other than electric when the tendency is toward universal application of electricity with attendant lower rates.

Industrial Load Building

We cannot make new industries in order to sell power but we can have trained men keep in close touch with industrial consumers to see that their requirements for power, small and large, are supplied electrically. They should be close enough to the consumer that they would know when plant expansion or changes are contemplated, so as to influence the further use of electric power.

Regarding new processes and industries, practically all of the additional outlets for large blocks of power are involved with process heating, furnaces and electrolytic and electro-chemical developments. Our commercial departments should be well informed on the natural resources of the territory and, possibly in cooperation with chambers of commerce, efforts should be made to attract industries. Mining should be given every reasonable encouragement and we should lend assistance in the development of electrical smelters for ore and other applications to this industry.

Little is heard today about railroad electrification and possibly the introduction of the Diesel-electric locomotives has made less possible main line electrification on a large scale. However, electrification of heavy mountain grades and congested traffic and terminals has been proved to be advantageous. We have both conditions in many parts of the West and such electrification would use a large amount of power. Trackless electric trolleys each use 100,000 kilowatt-hours or more per year so great effort should be made to hold the city traffic load in competition with motor buses.

Agricultural Load Building

Our rates should be such (in most instances they are) that we can invite an honest comparison with competitive forms of power. It is essential, however, that costs of electricity not be compared directly with costs of fuel and lubricating oil but that overhead, depreciation, taxes, insurance, reliability and other intangibles be given a proper valuation. It is oftentimes difficult to get the average consumer to see these things but we should be able to work through the Farm Bureau, agricultural colleges and other organizations in which the farmer has confidence.

This paper suggests—

1. ***Financing of terms on commercial appliances and wiring***
2. ***Single meter rates for commercial and industrial establishments***
3. ***Trackless trolleys to build back street railway revenue***
4. ***Customer-owned transformers on farms to reduce power cost and encourage greater use, particularly in off-peak applications***
5. ***Air conditioning as the next big field of development***

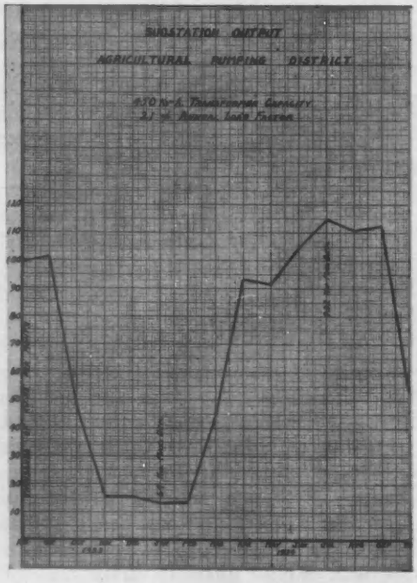


Chart of load on an agricultural substation, showing the need for a winter month load to balance pumping

One company in California has a schedule which allows the agricultural power consumer to take his domestic service through the power meter if the consumer owns the 440/220-110 volt transformer, the billing load being increased according to the rating of this transformer. This is a great inducement toward making the farm and residence completely electric. In addition to an all electric home the rancher should apply electricity to such things as:

Incubating, brooding and other poultry uses.
Sterilizing and other dairy uses.
Feed grinding.
Refrigeration.
Miscellaneous small power.

A curve of monthly kilowatt-hour output is shown herewith for a certain substation in an agricultural pumping district. A particular effort should be made to build up winter load to fill the valley from October to March. Incubating and brooding takes place during this season and incidentally, lead covered soil heating cable has been found to be most adaptable to these uses. It is especially valuable in converting equipment from other forms of fuel. A few days ago an agricultural consumer said, "Low bill this month. Wife cooking on wood stove. The electric range doesn't throw out much heat."

This brings up the big possibility of selling additional winter kilowatt-hours for heating rural homes. This load will come on when the irrigation pumping is off. Many consumer-owned transformers are small compared to the heating load which might be installed. A double-throw switch could be used in connection with the pumping motor and this brings up the problem of voltage. In order to progress we must sometimes get away from conventional practice. Air heating runs into large connected load so we should possibly consider using higher voltages.

Why could not a 440-volt air heater be designed with a heavy frame to be well grounded so that it would be perfectly safe? It could not be portable but would have to be built in. For example, a consumer with a five-horsepower motor could possibly have two 5,000-watt air heaters installed in his house, wired so that either could be on high with the other off or both could be on medium or low simultaneously. This might be expensive but it could be financed on a four or six-year plan. The rate could be made very reasonable. On existing agricultural rates it would be one cent or less for some consumers

but it would have to be lower than that to really be used for house heating.

One prospective irrigation consumer asked about an off-peak rate. He would build a large reservoir and pump only during the eight or ten hours at night that the system load was light. Such an off-peak rate might be worth while and it would help fill in the valleys.

Close personal contact is especially important with agricultural consumers. The average farmer is not inclined to do a lot of thinking for himself and the utility should have representatives capable of acting in somewhat of an advisory capacity. Free pump testing is one of the finest services we are now giving the ranchers and it has done a great deal toward proving to them that we realize that our interests are mutual.

AIR-CONDITIONING

Air-conditioning has a big field in commercial, industrial and agricultural applications. Man has always heated his bulidings and now he has come to realize that it is also important to hold temperature and humidity down to reasonable limits in order to make for health, comfort and efficiency. The idea of air-conditioning is generally accepted and it remains to sell the equipment. Utilities can best do this in cooperation with dealers. The reversed cycle refrigeration offers great possibilities for an all-year air-conditioning load.

Electricity is the ultimate form of energy. It is capable of most accurate measurement and most perfect control. Its applications are unlimited and its use is destined to become universal. Will its generation, transmission and distribution remain in the hands of the privately owned and operated utilities? While this question is at the present time a political football, our commercial activities may go far toward determining the final answer.

WALTER N. KOSKINEN

An United Industry Is the Best Defense Against Regimentation

By WALTER N. KOSKINEN
Sales Department, Pacific Gas and Electric Co., Oakland, Calif.

COOPERATION within the industry may be defined as the necessary help and undestanding which one group or individual gives to the work of another to the end that both will receive greater benefit. There is no individual or group that can truthfully claim to be self-sufficient, but each upon analysis finds that every success has been made through an exchange of cooperative action.

The manufacturer depends upon the jobbers and dealers to provide outlets for his product. The utility depends upon both the place additional load on its lines. The contractor—as a connecting link between the manufacturer and utility — prospers in direct proportion with them.

Advertising which benefits one group invariably benefits another at the same time and the cost of advertising is frequently rightfully divided between them.

While cooperation to increase sales and render more efficient service is usually carried on for the purpose of increasing profits, there may be other reasons which make it highly desirable.

At the present the industry is faced with the problem of developing a great new market for surplus power. Failure in this tremendous task may threaten the very foundations of the method of conducting business for profit by which the industry has been able to reach its present high standard of development.

A new era is undoubtedly ahead for the electrical industry. We can, by greater cooperative action and far-seeing leadership, move forward to establish a new and higher standard of industrial progress and retain the just rewards which in the past have always attended such success, or we can drift along and by our inaction permit some more aggressive power to seize control and perhaps regiment the industry into becoming the plaything of various political factions.

Cooperation

First prize winning answer to the problem, "What are the Most Effective Methods of Increasing Cooperation Within the Industry?"

A united industry operating at maximum efficiency and rendering an adequate public service will offer the best defense to outside interference with the operation of the industry. The success of the industry in solving this and other big problems before it will be largely determined by two factors:

1. The ability to command the leadership of big men, with the welfare of the whole industry at heart, and capable of bringing the various branches of the industry into closer cooperation.
2. The ability to win the cooperation and wholehearted support of the rank and file of the industry.

The need for greater cooperation than has theretofore existed has been brought about for several reasons:

1. Increased competition between industries for the consumer's dollar.
2. The necessity, for reasons of economy, of doing things on a larger scale and over a wider territory.
3 The necessity of concentrating larger forces to accomplish what small groups cannot successfully do alone.
4. The shortened time element, requiring an organization which can move quickly.

That such problems can be successfully solved through extensive cooperation has already been proved and much has been done to set up the proper organization to bring it about.

The P. C. E. A. is this type of organization and can be the solution to many

of our cooperative problems. Its scope and purpose may be enlarged as required. Only the greater support of the industry as a whole is needed to enable it to initiate and coordinate business building efforts that will be of the greatest value to every branch of the industry.

If in the ultimate self-interest of the entire industry it becomes necessary for one group to make some immediate sacrifice, the recommendations of a central body of this type representing all branches of the industry should be preferable to dictums of a politically dominated government agency.

As has been pointed out before, the first requirement of cooperative action is trustworthy leadership. The P. C. E. A. or whatever organization is to guide the destinies of cooperation in the industry, hereafter referred to as the association, must continue to draw the most trusted and able men to its board of directors and to the chairmanship of its various committees.

The second requirement of the industry, that of more extensive cooperation, is perhaps the most difficult of attainment; it will require the wholehearted support of practically every person connected with the industry.

The power to develop new business and create public good will that is inherent in the great body of workers of the industry is of such value as to be worth every effort of organization to bring it into cooperative action.

It would not be asking too much of any individual to give a full measure of cooperation to the business building efforts of the industry that furnishes him a livelihood. Many who would now desire to are unable to do so because of late notice, lack of information upon the proper method of procedure, or insufficient incentive to make the effort seem worth while.

In order to obtain the maximum of cooperation and that none might lack the proper notice and information, it would be desirable to include in the rolls of the association practically every worker in the industry.

Membership should be made easy by eliminating initiation fees. The only requirement should be the willingness to participate in the cooperative work of the association. Active cooperation can be assured by the proper incentives. The following business building efforts are suggested as among those likely to benefit through such cooperation.

1. Special sales campaigns of electric appliances, lamps, heating, refrigeration, lighting and air conditioning. Members of the association to be eligible for bonus, commissions, prizes, etc. for prospects developed and sold.

2. All association contests to produce new ideas. In some of these the general public should be included to increase electric-mindedness. A letter contest describing the many uses of electricity in the home is an example.

3. The distribution of information concerning special inducements. Easy term payments, federal loans, and ½-off rates are examples.

In addition much accurate information concerning the operation of various branches of the industry may be passed on to correct misleading impressions that may become widespread if not checked in time.

A condensed weekly publication of cooperative activities within the industry to tie in with a larger monthly journal would be valuable in keeping all members informed of the latest developments.

To make memberships more attractive and valuable the following activities are suggested for further consideration by the association:

1. The establishment of various courses of vocational instruction dealing with methods that have proven most efficient and saving in time, energy and materials. Also to include an educational service to supply such information upon request.

2. A department to stabilize employment conditions within the industry and to assist members in solving the problem of individual security.

3. A department of recreation to sponsor athletics, provide vacation camps, picnics, etc.

The members should, of course, be able to seek assistance from the association in all cases dealing with the need for cooperative action. Some of these might be, for example:

1. The development of new equipment to meet the needs of industries which are technologically related to the electric industry and to which it may render a sort of general engineering service.

2. The establishment of standards for installation of better jobs thus reducing sales resistance.

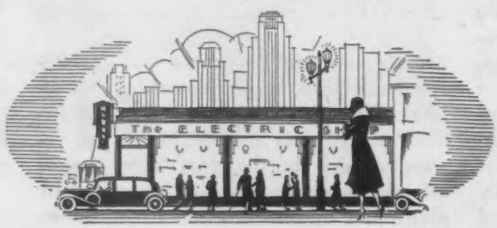
3. The cooperation of manufacturers toward simplification and availability of replacement parts.

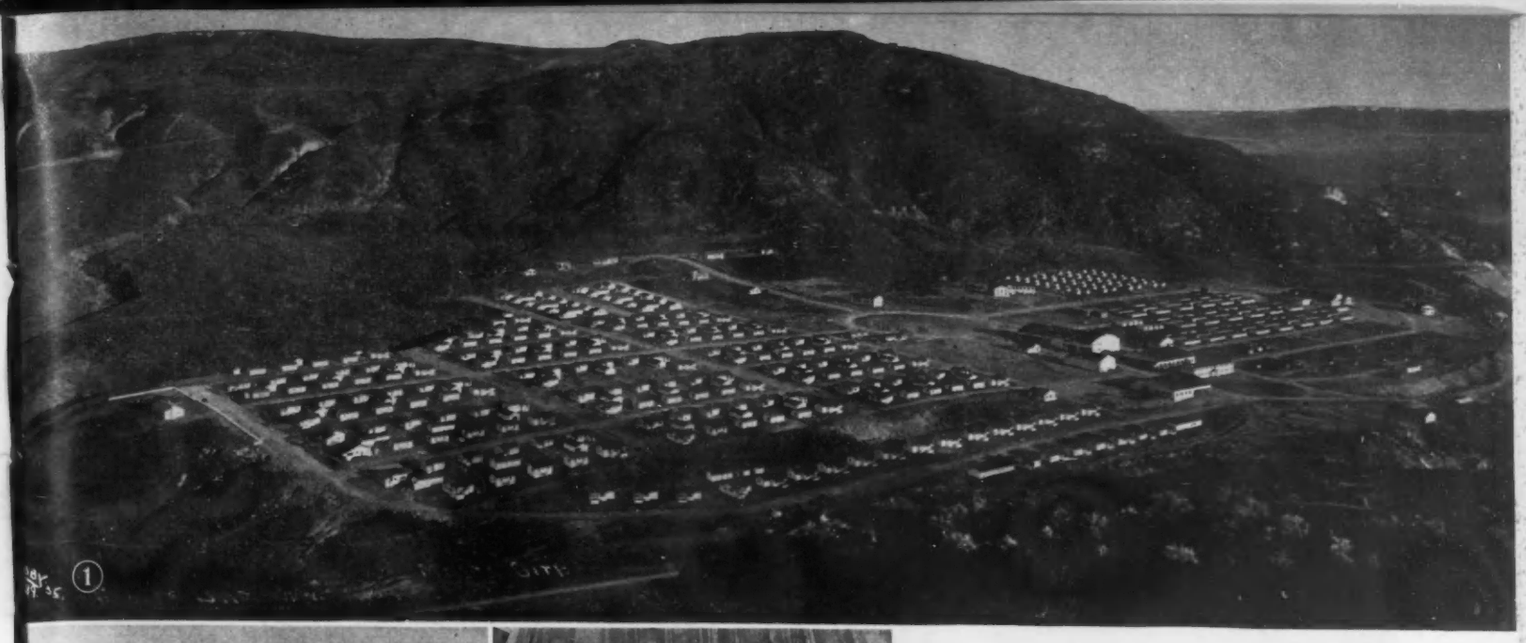
4. To secure the cooperation of code authorities in the correction of abuses.

Finally it is to be hoped that a policy of 'live and let live' will temper the actions of those who find themselves for the time being in a position of being able to "hog" a greater share of the business than they need and that the struggle between competitors within the industry for a small share of business shall by cooperation become a happy division of a much greater overall total.

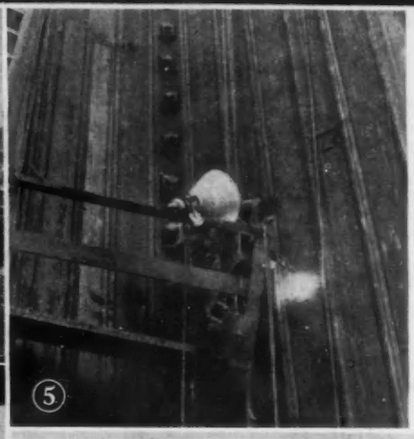
This paper suggests—

1. ***Command the leadership of the big men of the industry to bring the various groups closer together***
2. ***Enroll everyone in the industry in the association***
3. ***Conduct sales campaigns, contests, and activities to bring all into the cooperative purposes of the association***
4. ***Establish courses in vocational training and a department to stabilize employment so as to assist members in the problems of security***
5. ***Develop the association as the body to appeal to for cooperative action, information and mutually beneficial movements for standardization***





GRAND COULEE
Inspection Trip No. 2



(5) Electrically welding the steel piling in the coffer dam. (7) Looking down into the coffer dam where excavations for the foundations of the main dam are being carried on at an amazing rate

(1) Mason City, the contractors' town at the dam site. (2), (3), and (4) are views of the loading, transporting and dumping material excavated from the dam site via a 60-inch belt conveyor over a mile long which is capable of handling 4,000 tons per hour. Dirt removed from the site is thus carried up the side of the canyon wall and dumped into Rattlesnake Canyon, the route of the conveyor being shown in (6)

Diversified Loading Will Build Profits from Existing Systems

By S. M. MICHAEL
Power Salesman, Pacific Gas and Electric Co., Redwood City, Calif.

AN electrical system differs from a man in that it does not require eight hours of sleep and eight hours of play to offset a good day's work. The electrical system has been developed to help man in his eight hours of work and eight hours of play. Now the question becomes important as to what to do with the system while the man is having his sleep.

In the past the system has served mainly as an ever alert, but poorly paid night watchman. Since this night watchman does not feel fatigue, it is apparent that any work man may devise will be cheerfully accomplished to the profit of the sleeping man.

In studying this problem of finding work for the system it is apparent that we must turn to entirely new applications of electricity, or to new operating conditions for old applications in order to use up the off peak surplus. To determine the amount of surplus that is available for use requires a diagnosis of each individual circuit and a study of its resultant reaction on the rest of the system.

For the purpose of this problem the writer will use the typical load curves as developed by S. J. Lisberger for his presentation of the problem. It is assumed that the three typical areas supplied are:

1. Strictly Metropolitan.
2. Combined urban and rural.
3. Predominating rural area in which there are a few small towns.

The metropolitan area is divided into three zones: (a) residential, (b) commercial, in which there are small and large buildings, stores, hotels, restaurants and theatres; and (c) industrial.

The make-up of the system as a whole is illustrated by Fig. I.

Fig. 2 shows the load curve for a typical residential feeder in the metropolitan area on a winter day. This feeder is one of ten all serving the same general class of consumers supplied from a distribution substation. There is very little diversity between feeders serving the same class of consumers. As stated in the problem the annual load factor on this station is about 27 per cent. The evening peak makes it necessary to have equipment that is only 40 per cent loaded during the morning peak and much more lightly loaded during the early morning and afternoon hours.

The present load in the area consists mainly of lighting and small house-

System Loading

First Prize Answer to the Question: "From the Operating Standpoint What Types and How Much Additional Load Can Be Added to Existing Electrical Facilities?"

hold appliances with some heating and cooking. Increased usage of domestic appliances, such as the vacuum cleaner, mixing machine, radio and refrigerator, etc., would increase the daytime consumption without any appreciable effect on the evening peak.

Air conditioning, which includes cooling and circulating apparatus offers another opportunity. This type of load which necessitates the use of refrigerating units for summer cooling will tend to make the summer peak more nearly equal to the winter peak. Air cooling will be largely a daytime function and will not materially compete with the evening load.

In non-gas territory volume water heating offers a splendid opportunity for using the off-peak kw.-hr. It would possibly be advisable to install a time switch on the consumer's premises to limit the hours of operation. The rate for this off peak usage would have to be sufficiently attractive to induce the consumer to install a large volume, heavily insulated water tank.

At the present time many utilities are offering attractive rates where a water heater and a range are used and the demand limited by a double throw switch. There seems to be a large field among the non-range users for large volume, low wattage water heating. An automatic load limiting or time switch could be used to disconnect the water heater when a predetermined amount of lighting was turned on, thus effectively preventing any interference with the evening load.

Electric cooking and heating supplied from a metropolitan residential feeder will compete largely with the evening lighting load and necessitate additional facilities. There is, in most cases, however, sufficient leeway between the present peak and the station and circuit capacity to make this type of load attractive.

Fig. 3 shows the load curve for a typical commercial feeder in the metropolital area. Increased daytime lighting in the establishments that normally close at 6 p.m. seem to be the best outlet for available kw.-hr. in this area. From the load curve of the typical commercial feeder the load from 8 a.m. to 6 p.m. could be increased approximately 25 per cent to bring it up to the evening peak. Commercial lighting is a high revenue load, operating at unity power factor thus making it desirable. The development of commercial air

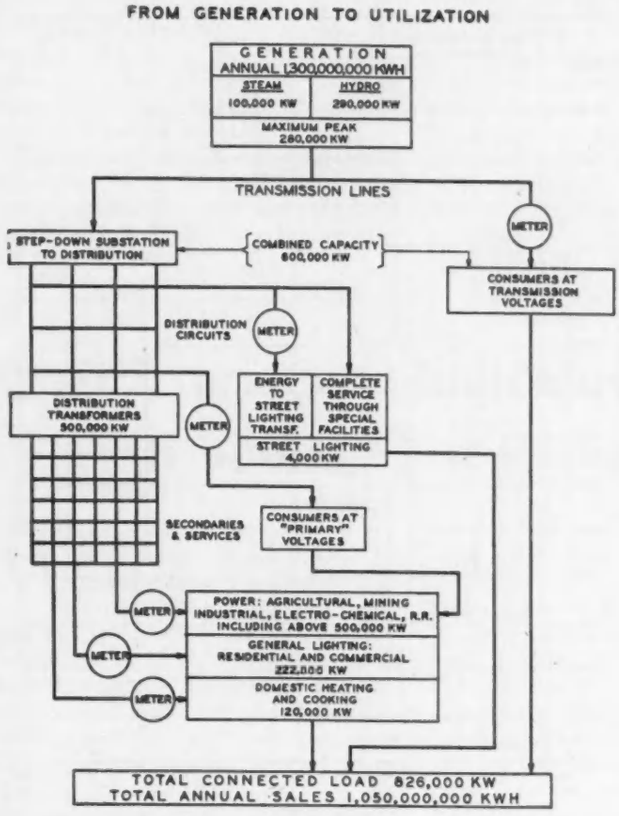


Fig. 1—Channels of energy distribution for a typical Western system from generators to consumers

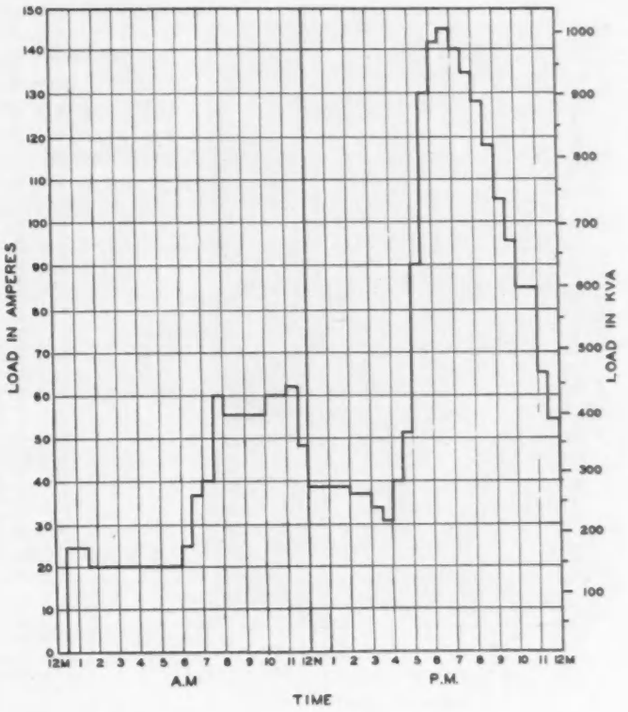


Fig. 2 — Typical residential feeder loading in a metropolitan area on a winter day

conditioning offers a splendid opportunity to increase daytime use.

To use the excess kw.-hr. from 10 p.m. to 8 a.m. presents more of a problem. Again large volume, off-peak water heating may be the solution.

Fig. 4 illustrates load conditions on a typical metropolitan industrial feeder. There seems to be but little opportunity for suggesting a new type of load to use the available off-peak kw.-hr. in the industrial area. Perhaps sufficient inducement could be offered in the way of off-peak rates to induce the indus-

Fig. 3—Load curve for a typical commercial feeder in a metropolitan area for May 26

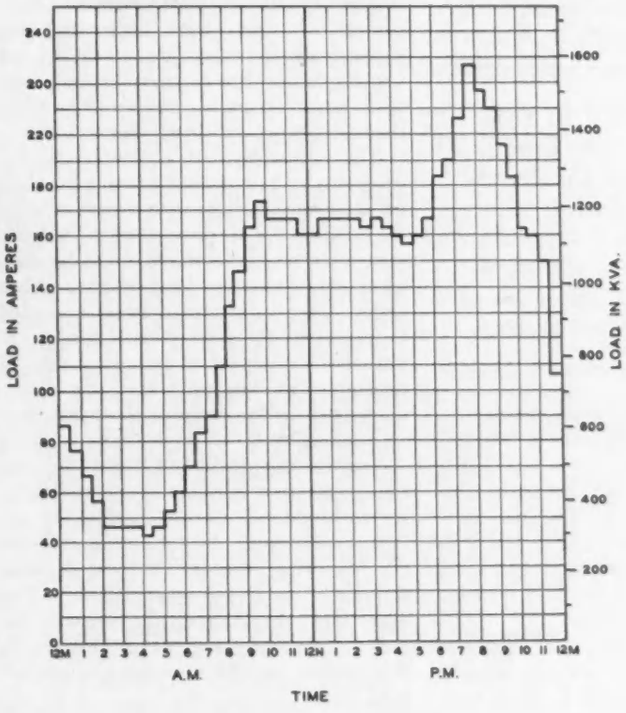
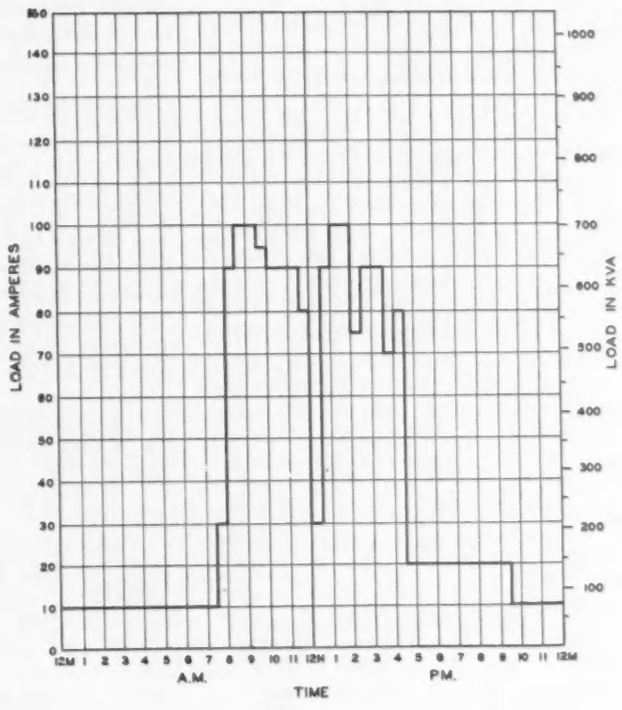


Fig. 4—Load curve for a typical metropolitan industrial feeder for a summer day



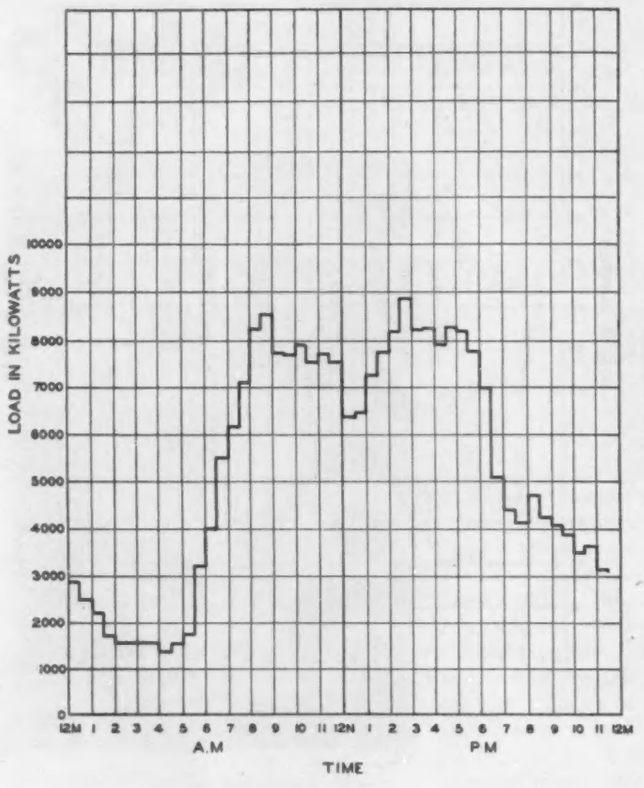


Fig. 5—Station load for a typical combined urban and rural area for a summer day

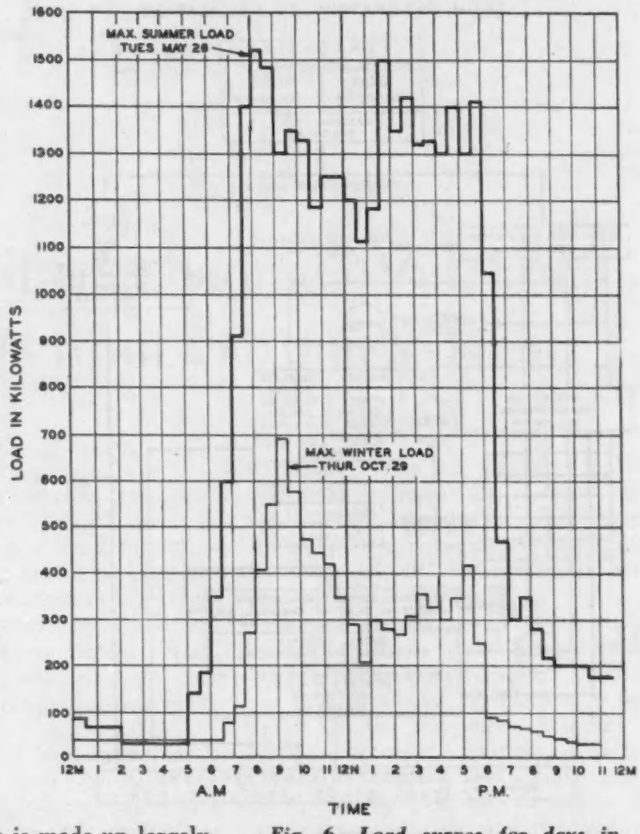


Fig. 6—Load curves for days in May and October on a typical feeder supplying a rural area

trial executive to change the hours of operation, perhaps split his crew into three shifts and operate twenty-four hours per day. This would be ideal for the utility and could be made attractive to the industrialist.

Street lighting in this area may also be beneficial.

A combined urban and rural feeder is shown in Fig. 5. A study of Mr. Lisberger's typical load curve for this class of territory shows that the only opportunity of adding to the consumption without increasing the peak lies between the hours of 6 p.m. and 7 a.m. Again the large volume, low wattage water heater offers an opportunity in both the urban and rural areas. There is also the possibility of creating in the rural areas an acceptance for soil heating and electrical devices to replace the smudge pots used during cold winter spells; also possibly a use for insect exterminating devices operating electrically.

Increased street lighting in the urban areas and highway lighting through the rural areas offers another large field for development.

The characteristics of this curve indicate a high daytime usage falling off early in the evening and picking up rapidly about 5:30 in the morning. The large daytime usage is made up largely of pumping, which is seasonal. The application of electric cooking, water heating and air heating, in addition to a modification of the principles applied to both strictly urban and the purely rural areas, will tend to fill up the valleys in this load curve.

The load curve for a feeder in a predominating rural area in which there are a few small towns is shown in Fig. 6. From the operating standpoint, the strictly rural areas offer the greatest opportunity of suggesting new loads and changes in present loads to improve the load factor. The two outstanding characteristics shown by this curve are, first the fact that the load is largely a daytime load, and second, that it is a seasonal load.

No Set Formula Will Solve the Problem of Longer Working Hours for Existing Facilities. Each Feeder Presents Opportunities Which Involve Cooperation Between Sales and Engineering Departments.

During the summer the daytime usage is high, falling off to almost nothing during the night. Since this load is made up almost entirely of agricultural pumping, the most obvious suggestion would be to induce the farmer to install a storage reservoir and to pump into this at night. Smaller motors could be used over a longer period of time, thus improving the plant load factor. This would be advantageous to the farmer through lowered pumping costs, and to the utility through improved load factor.

The adaptation of electricity to the growing of plants and trees is still in its infancy. Soil heating offers a wonderful field for development. The very nature of this load causes it to be used when the pumping load is at a minimum. Very little imagination is needed to visualize the use of soil heating in entire orchards of fruit, or fields of vegetables or flowers to force the development in order to meet the early season demand.

Another suggestion to offset the seasonal variation is to allow electric heating to be double thrown against the agricultural motor. In a great many cases the pumping motor is located near enough to the house to permit this. The loads are not competitive in any degree so that any kw.-hr. picked up in this manner would improve the annual load factor.

The use of electricity to prevent the freezing of crops or the inroad of insects will stand considerable development. Highway lighting should be stressed in rural areas.

The writer has made the foregoing suggestions from the standpoint of operating conditions. It is fully realized that economic conditions enter strongly into any analysis of this nature. Since the primary purpose of this problem is to point out, from an operating standpoint, the proper targets for the sales department to shoot at, we must not let present economic conditions make us too pessimistic, but point out routes that will lead the utility into greener pastures.

Field Experience Indicates Possible Distribution Cost Reductions

By HENRY H. BUELL
Superintendent of Electric Distribution Pacific Gas and Electric Co., San Jose

WITH the continued demand for lowered rates for electric service of the consuming public and the effort of the supply agency to satisfy that demand, the problem of the cost of supplying that service is a vital one which must be given the best thought and attention of every engineer. Lowered rates demand lowered investments and lowered operating costs. Unfortunately, however, lowered costs of construction and lowered operating costs do not go hand in hand. Rather one is practically the opposite of the other, considered from the overall standpoint. On the other hand, higher quality of the individual units but a relatively smaller number of these units may assist in solving the apparent paradox.

In considering this study one might well ask these questions:

During the years before the depression, did not the supply agencies make abnormally large investments in electric facilities in order to insure absolutely reliable and continuous service resulting in educating the consumers to always expect super service, a type of service which the rates in force could not justify?

Did not the agencies at the same time establish service practices, in the nature of subsidies, which the rates for energy could not justify?

Did not the agencies establish too narrow voltage regulation limits necessitating larger wire, more regulators, larger and more transformers, than appeared justified by the price paid for the service?

Did not the agencies give greater consideration to the safety details of construction, such as clearances, climbing space, dimensions of materials, than was reasonably proper?

Was enough thought given to labor-saving devices and equipment in order to counterbalance the steadily rising labor costs?

These and many other questions are involved in a consideration of the general problem. It is very apparent that the problem includes many other factors than merely the actual costs of constructing distribution lines and substations. The solution rests in a reasonable balance between these factors rather than in the reduction of costs in any one direction to a minimum, resulting in higher costs in other directions.

Rather than indulge in statistics and detailed cost reports and estimates of a quantitative nature, this study will be based primarily on qualitative suggestions and thoughts. It is realized that distribution engineers everywhere have considered the problem from every conceivable angle for years and that the technical literature is full of solutions to one or more of its phases, and that, therefore, it is very difficult to be entirely original in a presentation of this type. A common-sense study may bring about suggestions which may be of value, rather than a detailed technical engineering investigation with associated statistics and estimates.

Distribution Costs

First Prize Answer to the Question: "How Can the Cost of Electric Distribuiton Be Lowered?"

The Pacific Coast area offers considerable difficulty to the carrying out of a plan for cost reductions because of the great expansion in distribution lines during the years of plenty, both by reason of abnormally favorable extension policies and because of the availability of ready money on the part of applicants to assist in financing extensions. As a result both the urban and suburban areas are covered with a network of distribution lines fed by substations more or less advantageously situated. The problem, therefore, may be considered under two main subdivisions in general—reconstruction of existing facilities for additional load, and construction of rural lines for widely separated loads of relatively small amount, primarily domestic or single phase. These two divisions require different treatment when considering costs, either initial or ultimate.

The factor which has a very distinct bearing on the problem and which perhaps is not given all the consideration it deserves by the larger supply agencies, is the development work being carried on by the larger manufacturers. These concerns are equipped with the finest possible facilities for research designed to assist in reducing costs. Unfortunately, however, these manufacturers are not operating organizations and therefore do not have direct access to the actual field experience of the distribution engineer from which must come the ideas and suggestions for bringing about the desired results.

At the present time, with standardized methods and materials as laid down by centralized management of the large operating groups and holding companies, there is little if any incentive for the man in the field—the operating engineer—to present suggestions for

cost reduction and improvements in materials and equipment. This centralized management has largely removed any initiative which the rank and file of the men on the firing line may have had and has had the effect of causing men to forget how to think. At the same time it is realized that standardized materials and methods permit cost reductions in themselves. Nevertheless, there is a happy medium in this connection which should be striven for.

Is Super-Construction Essential?

Any engineer who has studied and compared the distribution line construction in the Pacific Coast area with that of the Middle West and East is at once struck by the great superiority of the Western construction in practically all particulars; of the greater strength, greater clearances, larger wire, higher voltages; of larger and higher poles, more and heavier guys, more strains in the guys—all this in spite of the milder climate and less severe storms with practically no sleet to introduce operating difficulties and increase maintenance costs. It is realized that this super-construction is required or at least recommended by governmental regulation, that every item of construction is covered by detailed requirements of strength and dimension.

Even a casual observation of statistics of failures will convince anyone that such failures as have occurred are due primarily to lack of maintenance, to causes beyond the control of the operating company, or to abnormal weather conditions in the form of freak storms which occur so infrequently as not to justify little if any consideration in the establishment of construction standards and which, for the most part, could not be protected against by any construction, no matter how strong. It is quite likely that the supply agencies have been to a considerable extent responsible for the super-construction by the establishment of standards specifying far greater strength and space requirements than the minimum provided in the governmental standards.

Guying

One of the larger items of cost in complying with the strength requirements of the code involves the guying of overhead structures in the various grades of construction. Theoretically the values may have some foundation when determined mathematically, but there are so many variables not susceptible of mathematical computation which are not considered and which affect the practical result, that these theoretical values should not be employed. No distribution line is a stable structure. Rather it is very unstable. It may be constructed initially with wires strung to exactly the right tension, with the poles straight, and with the guys tight and designed to support the load with the correct factors of safety under these perfect conditions. Subsequently, however, the guys give very slightly, the poles settle a fraction of an inch, the wire acquires a permanent stretch. As a result the guying, which initially had the correct factor of safety, now is far stronger than is required. The engineer who constructs lines with guys as required by regulatory specifications is at once struck by the very apparent excess in strength, a strength which his experience indicates is unnecessary except in rare instances.

Mr. Buell Suggests:

Cooperation with manufacturers on research.

Reduction of standards imposed by regulatory bodies.

Reduced guy requirements.

Reduced loading values.

Use of smaller poles, full-length pressure treated.

Revision of double arm requirements.

Placing all wires on one cross arm.

Use of bare wire in place of weatherproof.

Greater pole spacing.

Higher voltages.

Unit substation construction.

Better planning.

The strength of poles and conductors can well be considered from the same angle. Strength requirements as laid down by regulatory bodies specify values which are apparently arbitrary in character and are based on what has been accepted by most such bodies as best engineering practice but without any foundation in fact. Here again there are so many variable quantities, impossible of valuation, that no dependence can be placed on even the arbitrary values selected.

Wind, generally speaking, does not blow uniformly over any particular area but comes in gusts of relatively short frontage. The velocity is extremely variable along that frontage. Natural obstructions, hills and trees, as well as houses and buildings, have the effect of breaking up wind and reducing its effective velocity. A wind providing the force specified, is almost a hurricane and as such cannot be constructed for economically. The effect of the line itself in spreading these gusts to adjacent poles in the line is not given consideration, nor is the effect of a relief of the strain when any of the equipment deflects.

The facts indicate clearly why the average supply agency inherently constructs with too great a factor of safety —greater even than the minimums specified in the regulations. It is appreciated that this is done primarily for the purpose of simplification and reduction in stocks and in order to relieve the constructing and operating force of as much engineering detail as possible. In other words, all materials stocked and specified are of strength and dimensions sufficient to support maximum loads under most severe loading conditions. However, where guys are indicated in construction, the supporting structure is not required to have any particular strength, the guy taking the entire strain. For this reason, it would appear that the cross sectional dimensions of all poles might be readily reduced to much more conservative values.

Pole Maintenance

At the same time, the natural deterioration of all plant necessitating maintenance has a vital bearing on the subject. The item of plant most involved is the pole. Lowered quality and smaller dimensions of poles will have the effect of increasing the maintenance unless the causes of deterioration are corrected. Most companies use butt-treated poles universally while others have utilized a certain percentage of full-length treated poles, completely impregnated. Experience has shown that the butt-treated pole has an excellent life normally but that the relatively few cases of failure can be attributed to internal rot extending up inside the pole from the butt, probably due to checking or cracking at this joint. Smaller diameter poles full-length treated would correct the deterioration to a very large extent and would also permit the guy where required to exercise its function as intended. Smaller guys, practically possible as stated above, in conjunction with smaller poles acting merely as struts should satisfactorily account for a certain percentage of net saving.

Double Cross Arms

Cross arms, while a relatively small item, amount to considerable in the aggregate. The strength of cross arms is determined by the quality and grade of lumber. Arms smaller in cross section would require a better grade of lumber and accordingly little saving if any would result. On the other hand, estimates for distribution lines include a

large item involving so called double cross arms. Double arm construction is inherently expensive because of the extra hardware required. It is apparent from an inspection of construction in many localities, that abnormal use frequently is made of double arm construction on angles in lines. As a matter of fact, generally all of the strain is placed on one pin due to the angle at which the arm is installed and the other pin provides an emergency factor of safety only. It is suggested that the present grade of arm be continued but that double arms be almost entirely eliminated, the insulator being supported by the so-called steel pin installed in a pin hole of the size of the pin so as not to reduce the resistance of the arm to splitting. The brace bolt will have the effect of increasing this resistance.

Considerable thought has been given in various localities to the elimination of cross arms entirely on the one hand and to the placing of all wires on one arm on the other hand. The first plan has the effect of increasing the height of poles to provide the same clearances, which in turn increases the cost more than any possible saving due to the elimination of the cross arm. Naturally such a plan is considerably at variance with rules and regulations governing pole line construction and would require considerable revision of such rules if considered at all. Nevertheless, the use of a common neutral with single-phase primary might be one solution providing no snow load is ever encountered to permit contact between the primary and secondary during thaws. The latter proposal, however, while reducing the height of the pole, introduces complications where a considerable number of wires is involved which are difficult of solution. Accordingly it is evident that this latter type of construction as well as the conventional type in use in northern California both have their places and a proper use of each will bring about economies of considerable amount. It is the practice of each of the supply agencies to employ but one of the types of construction on its system in the interests of standardization and also for safety reasons. This proposal merely lays additional emphasis on the desirability of restricting standardization and permitting more initiative on the part of the operating personnel in any one locality.

Conductors

A consideration of the economics of the pole line construction inherently includes the item of conductors. There is no question but what great economies can be introduced in this one item alone, but it is not intended in this brief study to go into the intricate mathematical computations necessary to show the balance between conductor costs on the one hand, and losses inherent in conductors on the other hand. Regulation, also involved in such a technical study, cannot be evaluated since it introduces the human equation.

The use of bare vs. weatherproof wire has always been a debatable question

with the proponents of bare wire considerably in the majority. Where local regulations prohibit the use of bare wire in urban areas, efforts might well be made to bring about a revision of such regulations permitting the use of bare wire on the basis that weatherproof wire lends a false sense of security and may permit lines to remain alive in case of failure. On the other hand, bare wire probably would have a greater tendency to cause circuit breaker operation and also is very evidently not insulated and therefore dangerous at all times, whether in the air or on the ground.

Pole Spacing

Probably the detail of line construction which offers the greatest possibility for reductions in cost and at the same time is the most popular approach to a solution of the problem involves the spacing of poles both in urban and rural territory. It goes without saying that the elimination of half or a larger percentage of the poles in any distribution line will not only reduce the initial cost very materially, even at the expense of additional height of the remaining poles, but will have the effect of reducing the maintenance expense, there being fewer structures to maintain. At the same time greater horizontal or vertical spacing of the conductors is indicated which if not given consideration will result in impaired service.

Such a plan is easily applicable to rural line construction under average conditions, except in those cases where trees are involved, which in turn introduces another detail. In moderately densely populated rural areas, however, service connection to be made may introduce the need for unequal spaces, which in itself is not an objectionable feature. There is no question but that the average rural line now serving a given community could have been constructed with much fewer poles than were used.

The question of the type and size of wire to be used in long span rural construction has been debated pro and con and yet almost any engineer will intersperse long spans across valleys in a distribution line, using the same wire strung on the remainder of the line without any fear of failure. Naturally proper dead-ending methods are employed in such cases. Under average conditions the use of secondary wires does not become a factor. With long spans, individual transformers are indicated primarily for regulation reasons, considering the type of load usually found in rural areas, especially when two spans might inherently be the maximum distance to which secondaries would normally be extended.

In urban territory the use of long span construction presents an entirely different problem, which is affected by such details as block and property line locations as well as by the character of the load. Single-phase construction only is ordinarily required in residential territory, but occasionally a demand for polyphase service in residential territory is met. Where the heavy loads are encountered, long spans will automatically involve large sags unless the wires are pulled up to the greatest tension permitted, in which case heavier guying is necessary. In spite of these difficulties long span construction in urban territory will bring about economies.

At the same time in order to connect services without encroachment on neighboring properties these services must be supported by a messenger, the wires being connected in the span. This in turn will necessitate the development of new equipment such as portable self-supported extension ladders either mounted or unmounted and capable of use along the streets and in rear lot line construction, not on alleys. Joint pole construction will introduce some complications and necessitate higher poles but these difficulties are not insurmountable and should not materially affect the effort of one of the parties to reduce costs.

Distribution construction and reconstruction in industrial and commercial areas, with heavy loads comprising a number of circuits and large loads, does not lend itself to any self-evident economies. Frequently most of the work must be performed with the lines energized, inherently a slow expensive job. Traffic conditions and congested business areas prohibit reduced man

power. Here as in many other problems, the solution depends on constant vigilance by the supervising engineer—attention to all of the multiplicity of items which together make up the total cost.

The voltage of distribution lines has a very distinct bearing on the cost of construction. At the present time the cost differential in favor of the lower voltage, such as 4,000 volts, is not as great as was formerly the case. Transformers for the higher distribution voltages are slightly more expensive than are the lower voltage transformers, but the protective equipment is more costly for the higher voltages. In spite of this fact, the cost of copper for the lower voltages is naturally greater, the losses being equal. Here again, however, the conditions will determine the most economical voltage to be employed. Reliability of operation should always be a vital consideration. Insulators, fuses, switches, and other equipment for use on the higher voltages have been developed to the point where they are fully reliable and entire dependence can be placed on them in the field, providing proper selection is made. Accordingly this detail, formerly a definite objection to the use of the higher voltages, is no longer a factor.

Substations

Substations could well be the subject of a complete paper and can only be briefly touched upon. Even a casual glance at any of the substations by the experienced engineer, will indicate abnormal and unnecessary refinement in design, equipment and finish. It is the practice frequently for the electric company to design each substation individually and to incorporate ideas which are not repeated to any great extent in other substations; to assume theoretical situations and operating problems, which do not materialize in actual practice; and to provide equipment accordingly. Great stress has been laid on stability and permanence with the result that these substations are not capable of easy expansion or even of complete dismantling when necessary without large expense or great loss.

Certain manufacturers have specialized in substation detail and are able to furnish unit equipment which is relatively inexpensive and capable of expansion and contraction at will and at minimum cost. Greater use might well be made of such equipment available from any one of several manufacturers.

A very large part of the cost of electric distribution construction consists of labor. In general terms, labor amounts to approximately 50 per cent of the cost of construction. In case of reconstruction the proportion is much higher. It would appear then that the greater saving in cost should be made possible in this one item of labor. Gradually rising wage scales have increased rather than decreased this part of the cost. The present abnormal amount of unemployment has done a great deal of harm in gradually reducing the efficiency of the construction organization which in turn has the effect of increasing costs.

The only possible solution to this part of the general problem lies in constant and close supervision of the organization, with a view to eliminating the least efficient employees and especially in order to provide the proper size crew or gang to complete any particular estimate. At the same time, it must be realized that each crew entails a certain fixed overhead in the way of truck expense, a foreman and truck driver, where these would ordinarily be involved, and that too great a reduction in crew personnel will have the effect of increasing costs depending on the extent of the estimate. In other words, the crew must be made to fit the job and vice-versa. Observation indicates that, too frequently, not sufficient attention is given to this detail. Economy and efficiency are possible only through continuous supervision.

Planning

All of these various items can well be brought together under one general idea—planning. Most systems grow gradually and sometimes rapidly without thought as to the ultimate plan. Generally it is impossible to foresee which direction the growth will go, or how far, or how much load can be expected. Accordingly, voltages are selected which will be unsuited for the ultimate plan; wire sizes are either inadequate or unnecessarily large; substations are incorrectly placed and must be moved; or regulation is not suited for the character of load. Careful planning will save initial expenditures and reduce subsequent costs as well as limit operating expenses and fixed charges to the minimum commensurate with good service.

It is apparent that no hard and fast rule can be laid down for reducing the cost of line construction in all its details which would be applicable to all cases, but on the contrary, each case or at least each locality must be considered on its own merits. This in turn will entail a larger application of the engineering skill of the engineer in charge with larger discretionary powers relative to the methods and types of construction as well as in the selection and use of materials on the market. This plan will naturally have the effect of decentralizing and destandardizing such activities considerably.

Summarizing, the following details may well be considered by the engineer in his effort to reduce the costs of construction, remembering that all of them are not applicable to all estimates and that some estimates cannot, from a practical standpoint, include any of them:

Cooperation with research and development department of the larger manufacturers.

Reduction in maximum standards of construction through cooperation with regulatory bodies.

Reduced guy requirements.

Reducing loading values.

Use of smaller poles, full-length pressure treated.

Revision of double arm requirements.

Placing all wires on one cross arm.

Bare wire versus weatherproof wire.

Greater spacing of poles.

Higher voltages.

Simplified substation construction—employing unit construction.

Planning—in all details.

Decentralization of engineering responsibility and reduction in standardization of methods and materials.

The suggestions offered herewith are indicated by experience in the field and are based on the lack of failures, over many years, attributable to insufficient or inadequate guying, to small poles, to small wire, to single cross arms, or other construction detail. Naturally some failures will occur because of the reduced dimensions of equipment and lowered standards, but failures occur because of defects even with the higher standards and larger dimensions.

Line construction is made up of a multiplicity of small items and to make savings each of them must be considered individually. Lowered costs cannot be brought about by the elimination of any one item nor can any one detail alone be responsible for all of the reductions. The engineer must be continually on the alert, must pay attention to all details no matter how trivial they may seem. If rates are to be constantly reduced, first costs and operating costs must be reduced and the responsibility rests with the engineer. Continuous study along all lines in any way concerned with electric distribution and, above all, interchange of ideas through close association with others engaged in the same business will assist the distribution engineer in justifying the one reason for his existence—to supply the very best possible service at the lowest cost.

Voltage Regulation for Rural Feeders

By H. H. MINOR
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H. H. MINOR

Voltage Regulation

First Prize Answer to the Problem: "How Important Is Voltage Regulation? What Are the Most Practical and Economical Methods of Achieving It?"

IN ANSWERING the questions involved in this problem it becomes necessary to define good regulation and to justify its attainment. Having so defined and justified it, the practicability of methods that may be employed to produce such regulation must be shown. These methods must then be analyzed from a cost standpoint with due consideration given to reliability of the equipment used as well as capital outlay.

The determination of what range of voltage may be considered as satisfactory at the customers' equipment will depend on the use to which that equipment is to be put and to the design features of such equipment. The duty and responsibility of the serving utility is to provide reliable service that will allow the equipment that is operated by the customer to function satisfactorily at all times. Excepted from this responsibility to some extent are those few instances where the customer's own installation is the direct cause of unsatisfactory operation. The most important consideration in rendering satisfactory service is its reliability or freedom from interruption, but second only to this is voltage regulation.

Utilization equipment is designed for and rated at some particular voltage or voltages. Most satisfactory operation will result at that rated voltage. Deviation from that standard will result in other than rated performance. It is not practicable, however, always to supply just the correct voltage. Some tolerance is necessary. For any given piece of equipment or class of equipment a range of voltage at which it will operate to the satisfaction of the customer using it must be determined. It is his reaction from the results of such use that will determine the justification of the voltage limits set.

The utilities cannot stand still. They must build up their load. Much of this load building must be accomplished by increased use by present customers. No amount of advertising or other sales effort can adequately counteract the effect of dissatisfaction on the part of the customer with the service already rendered him. Good service, including correct voltage regulation, is a distinct help in load building and from that standpoint alone almost any expenditure necessary to achieve service that is satisfactory to the customer is justified.

Not only, however, is the range of voltage supplied important but also the average voltage should be given consideration. That average should be as nearly as possible the rated voltage of the equipment served. For resistance loads, such as lamps or heating devices, the energy consumed will vary approximately as the square of the voltage, as will the heat delivered by an appliance or the illumination obtained from a lamp. Thus voltage has a direct effect on revenue. On the other hand, while higher than normal voltage may be an advantage to the utility and produce greater output for the customer, the life of both lamps and heating elements will be rapidly lessened as the voltage is increased.

Motor loads are not affected in the same manner as resistance loads by varying voltage. The energy consumed is largely dependent upon the mechanical load being served. Losses only will vary with the voltage and they are usually only a small percentage of the total load. The operation of the motor, however, will be affected by the voltage. At higher than normal voltage the heat developed in the iron due to the excitation will be increased. At lower than normal voltage the current will be increased for a given load and the heat developed in the winding will be increased. At lower than rated voltage the torque of the motor is less than at rated voltage and difficulty may result in starting, or in maintaining correct speed.

Lighting, heating and motors represent the major types of load that will usually be encountered, it has been pointed out that for each of these classes of load it is important that the voltage at the equipment must be such as to insure satisfactory operation of that equipment for the customer. The limits of voltage supplied must be such as to produce the best possible operating conditions and the plane of voltage, that is, the average voltage should be at or near the rated voltage of the equipment. Therefore in considering these limits of voltage and the voltage plane the logical starting point is the equipment itself, or at the service entrance to the premises served if proper allowance is made for voltage drop in the customer's wiring.

Where domestic heating loads are served usually there will be lighting supplied from the same facilities. Therefore any voltage limits set for one must apply to the other. The rated voltage of most heating elements is 115 volts. That is also a standard lamp voltage although 120-volt lamps are in quite common use. For the purposes of this paper, 115 volts or multiples of that voltage will be considered as the rated voltage of lamps and heating devices.

Motors are usually rated at 220 volts or multiples of that voltage. An operating tolerance of 10 per cent plus or

minus from their rated voltage is considered satisfactory by the manufacturer. Thus for a 200-volt motor full load may be carried without excessive heating at any voltage between approximately 198 and 242 volts. This lower limit may not produce satisfactory results where very close speed regulation is necessary or if the motor is subjected to an overload.

Before the voltage limits at the customers' equipment that will prove satisfactory can be definitely determined, consideration must be given to the use of the equipment and the general character of the distribution system serving that load. While it might be argued that, regardless of locality or conditions of use, the class of service rendered should always be adequate and that to provide more than adequate service will entail excessive cost, from a practical standpoint some difference does and must exist. The modern secondary network in areas of high load density may easily and economically supply voltage that will vary a very small percentage from the normal or average. On the other hand, the long radial feeder serving a low load density area cannot provide that same unvarying voltage at a justifiable cost.

To adequately answer the second question in our title would require a discussion of complete system design. Such a discussion is not possible within the limits of one paper. The question must be resolved into many parts. The whole problem must be divided into a number of parts, each dealing with some particular part of a system, or some particular type of load. In the problem paper by Messrs. Buese and Ayres, such a group of problems are indicated. A more or less typical system set up is described covering a subtransmission system and distribution from several substations to both urban and rural loads.

Rural Feeders

One typical example that confronts most of our Western utilities that is not included in that set up, however, is the long radial rural feeder which serves a large agricultural pumping load and some domestic load as well. Such a feeder will operate at a high distribution voltage. Its load will be scattered from end to end of the feeder. It will supply a considerable number of domestic cooking and heating installations. It is such a feeder that will be considered in this paper.

This feeder is 12 miles long. It will operate at approximately 12,000 volts. Its load will be assumed to be evenly distributed throughout its length. This connected load will be 150 hp. in agricultural motors, eight lighting customers and four domestic cooking and heating customers per mile. This will result in a total connected load as follows:

Agricultural pumping, 1,800 hp.
Domestic lighting, 96 Customers
Domestic cooking and heating, 48 Customers.

Figs. No. 1, 2 and 3 are daily load curves of these total loads. These curves are taken from actual test of loads on a feeder similar to the one just described. They represent the loads that may be expected at the peak time for this feeder which will occur in the summer.

Mr. Minor Presents

A typical rural feeder with combined domestic and pumping loads of the type commonly found in the West.

He suggests that satisfactory regulation may be achieved by providing two circuits; by constructing separate circuits for the power and domestic loads; by the use of secondary regulators; or by the use of line regulators.

Each line of this character presents a separate problem and any one of the methods of regulation outlined might prove most suitable.

Fig. 1—Load curve of agricultural load only for a typical rural feeder

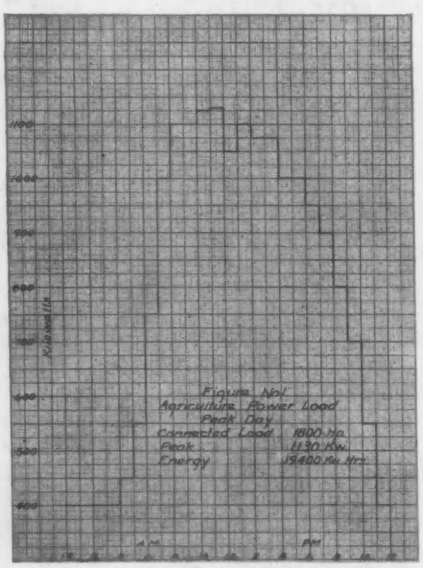

Fig. 4 is the combined load of these three classes and is the total feeder load.

As stated above, for such a feeder as this the voltage variation that must be considered satisfactory will not be that which would prove practical for the high load density area. The average voltage at the customers' equipment, however, should be quite close to the rated voltage of that equipment. That rated voltage will be taken as 115 for lighting, 115-230 for heating appliances and 220 volts for motors. A voltage variation of 8 per cent, that is 4 per cent above to 4 per cent below rated voltage will be assumed as satisfactory for the lighting and heating loads. This voltage is to be maintained at the customer's load.

Experience has shown that it is quite usual to find agricultural pumping motors somewhat over-loaded. They do not always receive the attention that they should. They operate continuously during the heat of the summer. Thus they are more subject to overheating than many motors serving other types of load. Thus the low limit of voltage set by the manufacturer as satisfactory will not prove as satisfactory for this type of service. The voltage range that practice has shown will prove acceptable is from 205 to 240 volts at the motor.

Thus we have as a starting point in determining the voltage that must be supplied to these loads, a high limit of 240 volts for the motor loads and 120 volts or 240 volts for the lighting and heating loads. This will then set a high limit for the feeder at any time or at any point on it of 12,000 volts, it being assumed that transformer ratios are 100 to 1 or 50 to 1. In determining this maximum feeder voltage the items of distribution transformer regulation and secondary drop as well as customer's wiring drop do not enter the problem as at any time one or more customers may have no load or so little load that these drops will be practically zero and the feeder voltage will be a direct measure of the voltage at the appliance. This is true because on such a feeder as the one considered most of the customers are served from individual transformer installations and secondary lines. This is one point of difference between such a feeder and one serving a high load density area.

In determining the low limit of feeder voltage, however, these items of voltage drop must be considered. The lighting and heating loads will be limited as to voltage supplied by the drops that will occur during their peaks. At that time these drops will be the maximum that

good practice will allow. We may assume 1 per cent drop in house wiring, 2 per cent drop in secondary and service and 2 per cent transformer regulation drop. This totals 5 per cent. Thus the low limit of feeder voltage at the time of this peak is found to be 11,600 volts.

In practice the voltage drops encountered are somewhat higher than those used above. This is particularly true of transformer regulation drop. Due to the relatively short time peak of domestic loads it is possible to overload the distribution transformer to a considerable extent. The limit of such loading is, in fact, the regulation of the transformer rather than its thermal capacity.

It will be noted in Figs. 2 and 3 that the peak of the domestic load occurs in the early evening. This does not coincide with the feeder peak which occurs during the day, usually just before noon. At that time, however, there is a secondary peak for the domestic heating loads of approximately 75 per cent of its evening peak. At that time then the voltage drops due to transformer regulation and secondaries and house wiring will be approximately 4 per cent and the low limit of primary voltage at the time of the feeder peak becomes 11,500 volts.

For the motor loads, the low limit of feeder voltage will be determined by

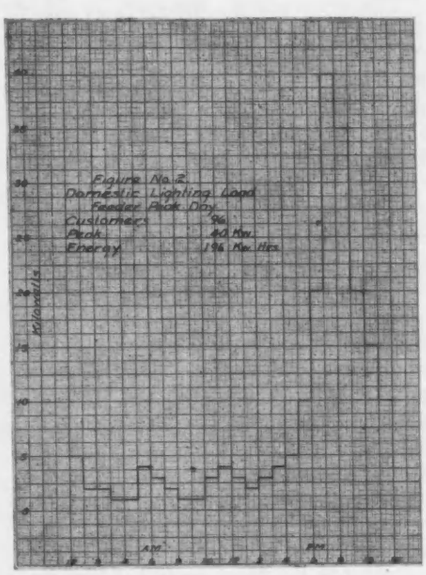

Fig. 2—Load curve of domestic lighting only for a typical rural feeder

transformer regulation and secondary drop. The power factor of this type of load is approximately 85 per cent. Thus distribution transformer regulation will be approximately 3½ per cent. Secondary and service drop will bring the total to 5 per cent. Thus to maintain a minimum of 205 volts at the motor the feeder voltage must not fall below 10,750 volts. This low limit would apply at any time as any individual motor may be operated at any time and when operated such motors will be fully loaded.

Thus we have the following voltage requirements for the feeder. In order to serve the domestic loads properly the high limit is 12,000 volts. At the time of the domestic load peak the low limit is 11,600 volts. At the time of the feeder peak the low limit is 11,500 volts. For the agricultural pumping

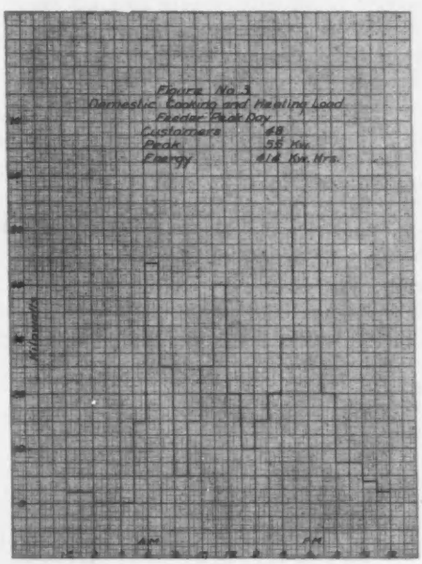

Fig. 3—Load curve for domestic cooking and heating load only for a typical rural feeder

load the high limit is 12,000 volts and the low limit is 10,750 volts.

The next question to be discussed is how this voltage may be supplied and maintained on this feeder. As the loads are scattered from end to end of the 12 mile feeder the limits mentioned above must apply to all points on the feeder. As the single feeder serves the several classes of load considered the limits are narrowed to those applying to the domestic load. Therefore the feeder voltage must never exceed 12,000 volts and it must not be less than 11,600 volts at the time of the domestic load peak, nor less than 11,500 volts at the time of the feeder peak.

Thus we have a possible voltage drop along the whole length of feeder of 400 volts during the early evening and of 500 volts during the feeder peak interval. From Fig. 4 it is seen that the total feeder load is 950 kw. at the time

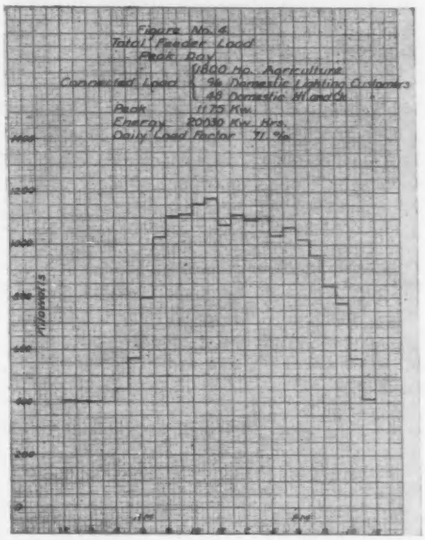

Fig. 4—Load curve of peak day for total load on a typical rural feeder

of the domestic peak and 1,175 kw. during the feeder peak interval.

If we assume that such voltage control or regulating equipment that is used is located at the substation from which this feeder receives its energy, the wire size that must be used for this feeder in order to keep the voltage within the limits set may be calculated for the loads assumed.

Feeder Size

During the lighting peak the size required would be No. 3/0. During the feeder peak, the size would also be No. 3/0 as although the load at this time is greater and the power factor slightly less the allowable voltage drop is somewhat greater. The cost of a No. 3/0 feeder is quite high. In the case of the line being considered, the small voltage drop that is allowable is due to the fact that the relatively small amount of domestic load requires close regulation while the major load consisting of agricultural motors will operate satisfactorily with a considerably larger voltage variation.

It is possible, however, to arrange or design the feeder in question so that the desired regulation of the whole load can be obtained without the use of such a weight of copper as would result from the use of No. 3/0 conductor. Voltage drop in a feeder is not directly proportional to the resistance and therefore to the area or weight of the conductor. It is a function of the impedance of the circuit, and that in turn is dependent upon the physical arrangement of the conductors as well as their size. That physical arrangement, the clearance or spacing between conductors, is fixed by

rules of construction issued by the Railroad Commission and by rules of practice gained from experience.

If we consider that instead of one feeder serving this load, two are used which will be equally loaded it will be found that each feeder may be constructed with No. 2 wire and give somewhat smaller voltage drop. The weight of copper per mile of line for the single No. 3/0 feeder will be 10,215 lb. For two No. 2 feeders the total weight of copper per mile of the double circuit feeder will be 6,432 lb. Thus the same or slightly better regulation will result from the use of two circuits of No. 2 wire than with a single circuit of No. 3/0 wire and a saving of 3,783 lb. of copper will result. This difference in copper cost alone does not tell the whole story however. The construction of two circuits, which in this case would be on the same pole line, involves some additional costs for cross arms, pins, insulators, etc. The mechanical load per pole, however, will be reduced and longer spans may be used. Required clearance from ground may require higher poles for the two circuit construction than for the single circuit, although by proper design this may be obviated.

In general the cost of the two-circuit No. 2 conductor feeder would be less than the single-circuit No. 3/0 feeder, the amount of difference depending upon the design of the lines. The results as far as regulation is concerned will be practically the same. The domestic loads will be supplied with a voltage that will allow of the close regulation they require and the motor loads will receive a much more uniform voltage than their proper operation necessitates. Costs of serving this total feeder load are still governed by the requirements of a small percentage of the total load.

If a feeder were to be constructed to serve the agricultural load alone the high and low limits of voltage on the feeder would be 12,000 and 10,750 or a drop of 1,250 volts in the total length of the feeder would be allowable. A feeder constructed of No. 4 copper would be sufficient to keep the voltage within these limits.

The domestic loads then must be cared for in some other way. One solution would be to construct a separate feeder for those loads. Their total demand at the time of their peak will be quite small. From Figs. 2 and 3 the high hourly average is approximately 100 kw. If we consider that from a practical standpoint No. 6 copper is the smallest wire that should be installed, the demand that such a feeder would care for and not exceed 400 volts drop in the 12-mile length would be approximately 300 kw. Therefore a circuit of No. 6 would provide much better feeder voltage for the domestic loads assumed than the limits set in this discussion.

Thus a circuit of No. 4 wire to which would be connected the agricultural load and a circuit of No. 6 wire which would supply the domestic load would result in a suitable voltage for the entire load. The total weight of copper per mile of line would be 3,273 lb. This is 6,942 lb. per mile less than a single-circuit No. 3/0 feeder would require.

This separate circuit to feed the domestic loads will require that all these loads be supplied from transformer installations entirely separate from those serving the power loads. This will entail some additional cost as, in the case of one circuit supplying all or two circuits each supplying one-half of the total mixed load, in some instances it is possible to serve domestic loads from the power banks. Such additional cost, however, will not be sufficient to overcome the saving in cost of the feeder installation.

Secondary Regulators

Another possibility of supplying the correct voltage to the domestic customers on this feeder may be mentioned. That possibility depends upon the development of satisfactory equipment to provide regulation at or near the load served. One manufacturing company is attempting the development of a small secondary regulator that can be applied to a 2-wire or 3-wire low voltage circuit. This device would automatically adjust the voltage supplied to the load within set limits. It could be installed at the consumers service, at the distribution transformer or at other points in the secondary. It would not only care for voltage variations in the feeder but would compensate for transformer regulation and to some extent for secondary line drop as well.

When and if this equipment is available, the domestic loads on such a feeder as the one being discussed could be connected directly to the No. 4 wire agricultural feeder. The same advantage, or in some cases increased advantage, of serving these loads from power transformer installations would be possible. In addition, because of the fact that transformer regulation would no longer be a limiting factor in serving these domestic loads, transformers can be more adequately loaded, secondaries may be somewhat longer or of smaller wire. In other words the voltage that will be supplied to the customers' equipment will not be affected by distribution transformer regulation or feeder voltage fluctuation within the limits of the secondary regulating device.

The cost of these devices will have to be such that to be justified for the feeder being considered in total it will not exceed the cost of the No. 6 line mentioned above.

Another possibility of design that will effectively produce voltage on this feeder within the limits set and at the same time allow of smaller wire than the No. 3/0 line considered above is to use step voltage regulators located at a point or points along the feeder. This in effect will divide the feeder into shorter sections which will be controlled as far as voltage supplied to each of those sections is concerned by the line regulator. If two sections are considered, that is a regulator installed at one point out on the line, the wire size could be reduced so that the drop from the substation to that regulator would be such as to provide feeder voltage within the limits set for that shorter length of line. Likewise the wire size for the part of the feeder from the line regulator to its end would be reduced so as to just keep the feeder voltage within prescribed limits.

This arrangement, however, would be subject to the same objections as the No. 3/0 single-circuit feeder. The total load would have to be regulated in order to provide close regulation for the small domestic loads, and the justifiable cost of the feeder so designed plus the line regulator could not exceed the cost of the No. 4 power feeder and the No. 6 domestic feeder which would provide as good or better regulation to those loads requiring close regulation.

In the discussion of this problem very little has been said about regulating equipment or methods. Much has been said about feeder design or arrangement. An attempt has been made to determine just what voltage conditions at the customers' equipment is necessary to provide satisfactory operation. It has been shown what resulting voltage limits are necessary for the feeder. An attempt has been made to show under what conditions those limits can be obtained. The underlying thought has been to suggest a solution of this vexing problem of providing proper voltage regulation for a long radial rural feeder in the most economical manner. The suggested solutions cannot be a final solution, except possibly for a feeder serving a load exactly like the

example used herein. Individual conditions of load, varying construction practice and general system regulation will all affect the results obtained.

The points that have been brought out are that the single-circuit feeder is not as efficient from a regulation standpoint as are combinations of two circuits; that a saving in costs may usually be possible by constructing separate circuits to supply agricultural motor loads and domestic loads; that a low capacity feeder circuit in conjunction with "secondary regulators" would provide the regulation desired; and that some economy may be effected by the use of "line" regulators. Of these various suggested arrangements it appears that the one most promising is the separate circuits for the power loads and for the domestic loads. In some cases this arrangement may not prove satisfactory or economical. The use of a "secondary regulator" if and when available seems a very promising solution.

The solution suggested has only to do with the feeder and its load. There will of necessity have to be regulating equipment between that feeder and the source of power. Whether it shall be feeder regulators, bus regulation, condensers or other devices will probably be answered in other papers. It is hoped that this discussion and the solution or suggested solutions for this one type of feeder will make a little simpler and a little less costly the task of providing adequate and satisfactory service to our rural customers.

Complaint Analysis Determines Extent of Free Service

By H. L. SMITH
District Agent, Pacific Gas and Electric Co., East Nicolaus, Calif.

AIM of this paper is to analyze the consumer service problem as regards the necessity for the service. Also several general proposals will be made which may have some value in formulating a policy which will be adequate to the customer's need, consistent with his value as a customer, and which will operate at a cost consistent with the utility's profit.

Any consumer's trouble, misunderstanding or dissatisfaction in connection with his electrical service is usually classified as a "complaint" by the power company. For this paper, consumer service is defined as that service rendered by the power company in connection with these complaints. This service is performed usually by a single employee for the benefit of one or only a few consumers.

The physical need or customer demand for this consumer service can be considered under four classifications as follows:

1. Service requirement where company alone is responsible.
2. Service requirement where consumer alone is responsible.
3. Service requirement where company and consumer are responsible.
4. Service requirement where appliance repairs are involved.

Where the company alone is responsible for the trouble the need for consumer service is apparent and it is obvious that the utility must provide an adequate service regardless of cost. The principal troubles in this class are tap and transformer fuse burn outs, distribution line failures, service wire failures and trouble involving meter equipment.

Improved material and construction have reduced these troubles to such an extent that now the utility has little direct control over their occurrence. For example, lightning causes many tap and transformer fuse troubles and automobiles crashing into poles cause many distribution line failures.

Service requirements involving consumer responsibilty alone are principally in connection with "no power." The consumer's fuses burn out from overloads, grounded wires, shorted wiring and defective equipment. On first consideration, it appears unfair to ask the utility to furnish a free consumer service to repair troubles over which it has no control. The practical difficulty is that at the time of the complaint the responsibility is usually unknown. The trouble may be on the tap line at the transformer or in the consumer's house. The consumer is not qualified to repair his own troubles, and since power companies have for years made much of the fact that they sell electrical service and not just kilowatt-hours, he considers that this electrical service includes the location and isolation of troubles on his premises. If this consumer's contention is correct, there is a real need for consumer service and the utility will always have to stand the major portion of the expense involved.

In such complaints as higher bills, voltage troubles and radio interference, the fault may be with either the consumer or the company. The need for consumer service is apparent since the power company must always investigate and clear up every trouble where it alone is responsible. This type of consumer service is especially important due to the fact that the consumer's mental attitude is a decided factor in the occurrence of these complaints.

The repair and servicing of appliances is properly the obligation of the manufacturer and his agent. The utility should only assume this obligation when it is necessary to stimulate and increase the sale of major load building equipment or new and unproven types of equipment. This necessity can be determined by the following considerations:

1. Is the consumer service essential to the sale of the appliance?
2. Is the appliance highly essential to the home?

Free Service

First Prize Answer to the Problem: "How Much Free Repair and Maintenance Service Can and Should the Power Company Give Its Customers?"

3. Can other agencies provide an equal or better service?

For example, there is no need for the utility to provide consumer service for such appliances as radios, ironers, vacuum cleaners, etc. The customer purchases them without any consideration of service beyond the conditions of the guarantees. A service interruption of a day or so is relatively unimportant and specialized outside agencies can provide a better consumer service than the utility. The electric refrigerator is an example of a highly essential appliance where there is no need for the utility to assume the consumer service obligation. Continued appliance servicing is a factor in its sale but due to the widespread use of electrical refrigerators, the manufacturer can or should be able to provide the necessary service more efficiently and completely than the power company.

The electric range is an appliance which is highly essential and service interruptions are very inconvenient. The continued consumer service consideration plays a very important part in the sale of the range. There is a real need for consumer service for this type of appliance and at present no outside agency can perform the service as efficiently as the utility. However, the electric range, water heater and air heater are proven equipment and an effort should be made to have the manufacturer assume the service duty in all but thinly populated districts.

A consumer service policy is like any other business policy in that its ultimate aim is one of two objectives; either to produce profits or to maintain present profits. The important profit elements in the consumer service policy are the indirect profit factor, the necessity factor and the cost or direct profit factor.

The indirect profit factor divides itself into three general considerations, namely:

1. Will the service help maintain present business?

2. Will the service help build up business per consumer?

3. Will the service help maintain the permanency of the utility in business?

Unfortunately the three considerations cannot be analyzed and evaluated in terms of money profit per year. Here, the value to be placed on consumer service must be one of judgment backed by experience. And obviously, this judgment value will vary greatly throughout the districts of a large utility. For example, a district where a highly competitive fuel is available will place a much higher value on any consumer service that helps retain and build up business than will a district entirely free from this competition. Also a district that is exposed to the threat of public ownership will place a high value indeed on any consumer service that does not antagonize the consumer but does help to retain or gain his good will.

In order to best produce indirect profits, the consumer service needs to be very flexible and the service needs to be rendered by trained employees. Whether he is a specialized service man or an all purpose service man, the employee should be courteous, efficient and able to discuss intelligently a very wide range of company activities.

Mr. Smith Believes

That service requirements fall in four classifications.

That appliance service belongs in the province of the manufacturer, the contractor and the dealer.

That the intangible profit factor should govern the extent of utility servicing.

That an analysis of all complaints will reveal valuable data on servicing.

That servicing policies should depend upon the district served rather than upon headquarters rules and regulations.

The analysis of revenue, complaints and complaint expense according to the various classes of consumers as defined by the rate schedules will provide important information in regard to the necessity and direct profit factors. This analysis will provide the following ratios per schedule:

1. The ratio between revenue and complaint expense per meter per year.

2. The ratio between complaints and meters per year.

These ratios may be further broken down for each type of complaint, namely, company responsibility, consumer responsibility, joint responsibility and major appliance repair. The ratio between revenue and cost per meter per schedule is the direct profit factor and when compared with the direct profit factors of other schedules, determines whether or not the consumer service expense is consistent with the money value (revenue) of the customer. These factors will also indicate what may be expected in the way of savings or increased expense by any particular change in the service policy. The ratio between complaints and meters for each schedule is the necessity factor. It shows the present demand or need for consumer service and indicates what changes may be desirable in the service policy.

The statistics in Table I are presented as an example of what might be accomplished by such an analysis as described above. These statistics are taken from a purely agricultural community. Due to the methods of handling the consumer service these figures are not complete and are not to be construed as a complete record of the consumer service for the district. They will, however, serve to indicate the value of an analysis by classes of service. The data in Table I are for the year December 1, 1933, to December 1, 1934.

Table I — Customer Data

Type of Service	Meters	Hp. or Kw. per meter	Kw.-hr. per meter year
Lighting	315	...	512
Domestic Cooking	131	9.9	3,690
Agricultural Power	290	16.5	12,600
Others	32	...	....

The consumer service data in Table II is taken from records kept from 1932 to December 1, 1934, a period of 33 months. These data were recorded under three headings—consumer complaints, company complaints and appliance repairs. Consumer complaints are those complaints where work is charged directly to the complaint tag while company complaints are those where the work is charged to a maintenance tag. The record data covered only the type of complaint, number of complaints and hours of field work.

Table II — Complaint Data

Class of Consumer	Lighting	Cooking	Agricultural
Meters	315	131	290
Consumer Complaint	52	21	48
Company Complaint	40	17	37
Appliance Repairs	..	250	..
Hours Field Work	134	404	123
Necessity—Complaints per meter per year	.3	2.4	.3
Direct Profit—Kw.-hr. per Hr. Field Work	1,200	1,190	29,600

Since complete complaint expense is not available, the ratio Kw.-hr. per hour of field work may be used as an indicator of the direct profit factor.

Table III — Complaint Data

Class of Consumer	Necessity Factor	Direct Profit Factor
Lighting	0.30	1,200
Domestic Cooking	2.40	1,190
Agricultural	0.30	29,600
Average	0.62	6,200

These figures indicate that the consumer service need for lighting and agricultural power consumers is the same, while the service demand for the major appliance consumer is eight times as great. The Kw.-hr. per hour of field work is about the same for the lighting and domestic cooking classes. For agricultural power the Kw.hr. per hour of field work is twenty-four times

greater than the other two. The direct profit factor indicates that the agricultural consumer is not receiving consumer service consistent with his value as a customer. The average direct profit factor indicates that the criticism of high cost of consumer service for the rural consumer may not be justified.

In conclusion, several general suggestions are offered regarding the designing of a consumer service policy. The policy should be flexible to meet the needs of various localities and classes of consumers. This flexibility in a large company can be best attained by making the policy divisional in nature rather than system wide. The division manager should have ample authority to lay out and define the consumer service best suited to the needs of his district. The division should be charged with the responsibility of keeping complete and accurate records of the service so that the direct profit factors can be obtained. The necessity for the division to operate its consumer service policy at a cost not to exceed a fair direct profit ratio will provide the necessary limitation on any divisional policy.

Bureau Lighting Ads Bring Unusual Response

Concentrating on lighting copy in the consumer magazines, the 1935 advertising of the Pacific Coast Electrical Bureau, prepared by the Erwin Wasey & Co., has struck a note which is bringing an unusual response. The number of coupons sent to the Bureau asking for booklets on lighting is surprising even to those who were most hopeful of results. Picturing a sweet and happy woman, over a title "The most cruel mother," the attention thus strikingly caught is carried naturally and swiftly into the thought that unknown harm is being done to the eyes of her children or family because of the inadequate light in her home.

The advertisements put the duty and obligation of securing proper lighting straight up to the mistress of the home and show in unmistakable terms, emotional as well as rational, the physical damages that follow inattention to this most important problem. No woman can escape the import of the message. It knocks at the door where she lives. Succeeding advertisements interpret the theme in similar fashion with just enough change in illustration, headline and text to maintain a continuity of form and idea. The coupon results as reported by the Bureau show that the advertisements are being read and heeded.

The keen interest manifest in the subject indicates that an opportunity lies open for the electrical dealer to follow through after the Bureau's advertising with displays and selling to satisfy the demand created by the advertisements. Since the Bureau's advertising is of a general nature, Bureau supporters urge that those selling lighting equipment identify themselves to the advertising and sell the lamps and fixtures which will bring about a better sight condition in the homes of their customers.

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• PRESIDENT L. E. MAYER, National Electrical Contractors Assn., in a letter, first to his executive committee, and in subsequent letters to the membership, has urged contractors to help the utilities to gain a better public understanding. He urges taking the initiative in getting started a program of cooperation in each area.

DEALER SALES REPORTS—MARCH-APRIL 1935

A Summary of the Dealer Reports Compiled by Associations, Societies or Bureaus, or Dealer Contact Departments of Utilities

APPLIANCE	P. G. & E. Co.[1]		San Diego Cons. G. & E. Co.[2]		San Joaquin Lt. & P. Corp.[3]		So. Calif. Edison Co., Ltd.[4]		Utah Power & Lt. Co.[5]		Wash. Water Power Co.[6]	
	*March 1935	4 Mos. Dec.-Mar.	April 1935	Year to date	April 1935	Year to date	April 1935		April 1935	Year to date		
Ranges	81	366	29	75	141	511	635	1,785	239	637	.....	.....
Water Heaters	33	126	68	125	85	263	304	1,061	45	78	.....	.....
Air Heaters—aux.	169	1,914	.....	2	33	51	46	490	7	98	.....	.....
Air Heaters, 220 volt	27	206	37	484	37	270	.....	.....	.....	.....	.....	.....
Refrigerators	2,213	6,386	460	961	834	1,704	3,821	7,491	749	1,612	.....	.....
Dishwashers	14	25	.....	.....	5	6	.....	.....	.....	1	.....	.....
Washers	2,081	8,273	230	804	366	1,191	2,763	8,742	650	2,813	.....	.....
Ironers	621	2,528	32	144	34	169	432	1,286	28	116	.....	.....
Vac. Cleaners	1,804	6,974	121	473	92	327	1,358	3,403	498	1,821	.....	.....
Radios	4,853	23,569	676	3,250	387	1,786	3,903	15,420	571	3,098	.....	.....
Mixers	315	1,038	46	180	62	202	308	1,076	93	749	.....	.....
Cookers & Caseroles	.....	.....	17	67	12	58	48	129	17	33	.....	.....
Irons	.....	.....	237	853	263	1,143	1,221	4,501	621	2,522	.....	.....
Waffle Irons	.....	.....	122	532	90	426	374	1,442	169	728	.....	.....
Toasters	.....	.....	188	732	96	455	567	2,002	307	1,275	.....	.....
Table Stoves, Grills, etc.	.....	169	21	219	92	415	269	915	376	1,745	.....	.....
Heating Pads	.....	.....	45	310	.....	.....	152	872	91	555	.....	.....
Curling Irons	.....	.....	.....	.....	.....	.....	58	250	208	711	.....	.....
Perculators & Coffee Makers	.....	.....	144	426	96	370	338	1,235	164	509	.....	.....
Sewing Machines	1,097	4,408	16	60	.....	.....	.....	.....	.....	.....	.....	.....
Clocks	.....	.....	.....	.....	87	369	347	1,449	172	672	.....	.....
Fans	.....	.....	.....	.....	.....	.....	68	108	13	29	.....	.....
Floor Polishers	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Sun Lamps	.....	.....	.....	.....	.....	14	30	116	8	38	.....	.....
Portable Lamps, Reflectors	.....	.....	.....	.....	95	348	.....	.....	1,638	.....	.....	.....
Misc. Lamps, Pin-up, etc.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Yard Lights	.....	.....	.....	.....	42	155	.....	.....	.....	.....	.....	.....
Misc. Small Appl.	.....	.....	244	913	138	541	497	1,650	4	.....	.....	.....
Total Dealers	.....	1,400	.....	100	.....	.....	585	585	.....	.....	.....	.....
No. Reporting	.....	.....	.....	.....	132	119†	538	511†	.....	243†	.....	.....

*April Report was not available at time of going to press. † Arithmetical average number of dealers reporting since first of the year.

[1] P. G. and E. reports obtained only on major appliances upon which accurate reports are available from dealers' accounts. Total dealers include gas as well as electric dealers. First report of year 1935 starts with Dec., 1934 and will be cumulative from that month.

[2] Gathered by Bureau of Radio and Electric Appliances of San Diego County. Clocks, fans included under miscellaneous.

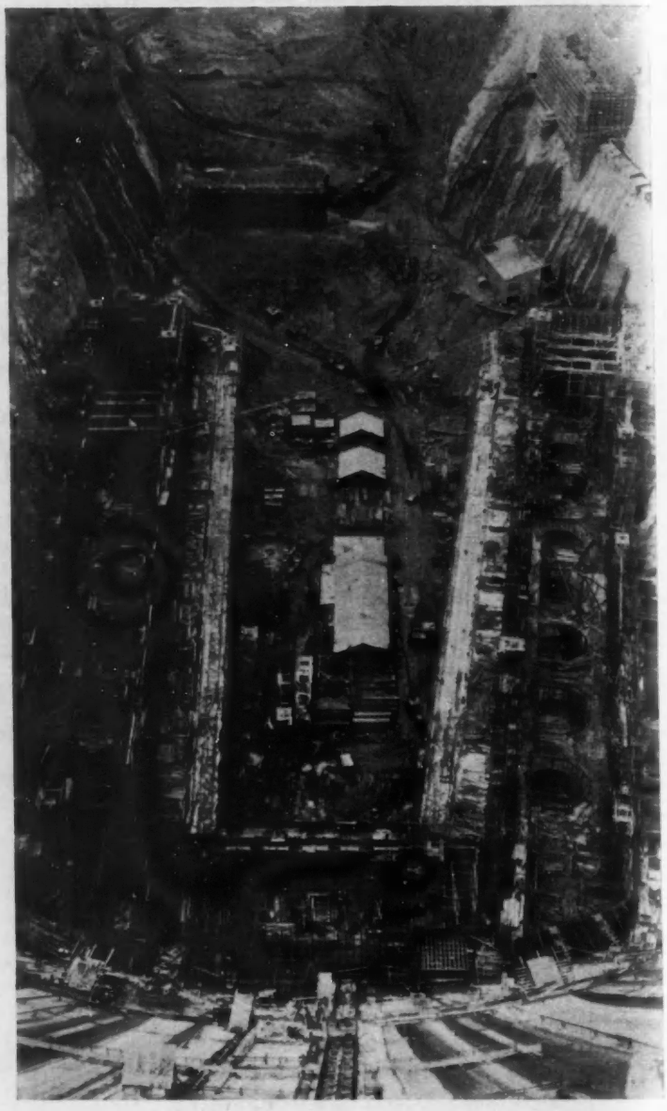
[3] Includes dealer reports from Midland Counties Public Service Corp. territory also. Compiled by Valley Electrical Supply Co.

[4] Includes reports from dealers on San Joaquin Valley system of the company as well as Southern California areas served. Comparative figures of same month last year indicates improvement.

[5] Includes Utah Power & Light Co. territory in Utah, Idaho and Wyoming. Also Western Colorado Power Co. territory.

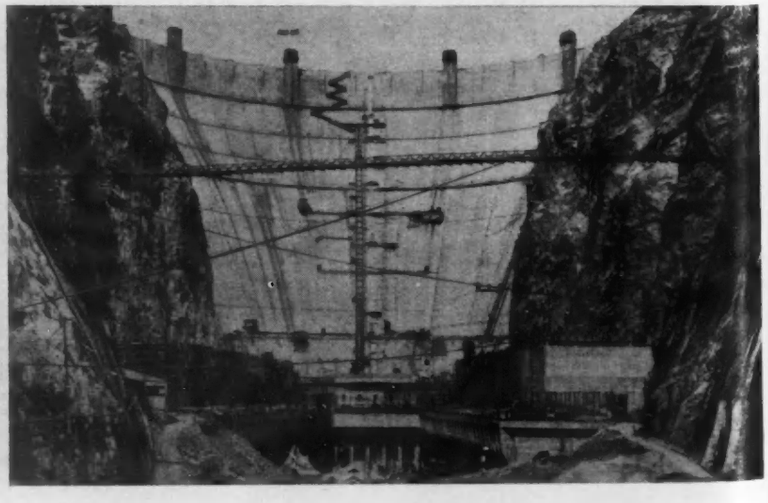
[6] Dealer sales only for Spokane and company's territory. Company sales not included. Table stoves, grills included with cookers. Report not received at time of publication.

Left—A section of 30-ft. steel penstock ready for lowering into the canyon by the 150-ton cableway which is a permanent accessory to Boulder power house. This huge cableway offers the only practical means of placing heavy equipment into the erection bays in the power house. Below—A view looking down from the top of the dam into the power house



BOULDER DAM
Inspection Trip No. 3

Below (left)—Upstream face of the dam showing the beginning of the 30,000,000 acre-ft. reservoir and the intake towers for the penstocks leading to the power house. (Right)—View of power house construction on downstream face of the dam



Committee Reports

Northwest Electric Light and Power Association
1934-1935

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Business Development Section* + + +

Introductory Statement

By TOM D. FULFORD
Chairman

ACCLAIMED by old timers as one of the most enthusiastic and beneficial Business Development Section meetings ever held, the tenth annual section conference brought the committee work to a close at Vancouver, B. C., February 21 and 22, 1935. The tempo of the meeting was fast; the reports, which were principally devoted to actual experiences in the several fields of load building, were well presented; many points were dramatized by skits and motion pictures; and local arrangements were ably handled by W. C. Mainwaring and E. E. Walker of the British Columbia Electric Railway Co., assisted by a large staff of employees of that company. The meeting was held in the auditorium of the B. C. company building on Granville Street where stage settings were provided for the skits. The sessions were recessed in the middle of each morning and afternoon for a relaxation period during which coffee, tea and cakes were served by the employees of the B. C. company. Registration of 138 was slightly larger than the previous year and contained a substantially larger registration from outside the city in which the meeting was being held.

Practically all the papers and reports presented at the meeting under the three Bureaus are published in the following pages and need not be referred to in this summary. I will refer, however, to those events of the program not published.

The meeting opened with a welcome from W. G. Murrin, president of the B. C. Electric Railway Co., to which L. R. Coffin, vice-president of the Puget Sound Power & Light Co., and president of the association, responded. Mr. Coffin keynoted the meeting when he stated that the commercial men would have to sell the industry out of the depression.

In the program of the Commercial and Industrial Sales Bureau on the first day, a paper by a A. H. Greisser, Portland General Electric Company, "Meeting Competition of the Small High-speed Diesel Engine," was read, but this paper is not published herein.

A feature of the program of the Rural Sales Bureau on the first afternoon was the showing of a film, "Jim Stays on the Farm," produced by H. D. Kem, The California Oregon Power Co. This film, with sound track inserted later, was taken with an ordinary amateur movie camera using amateur actors, and portrayed just enough of a romantic story to furnish the background for showing some 20 actual farm applications of electricity.

At 8:30 on the morning of the second day, prior to the opening of the general session, there was a showing at the Colonial Theater of promotional and advertising films produced by the B. C. Electric Railway Co. These films, used as trailers in the regular picture houses, were produced with amateur actors from the company, directed by James Lightbody, advertising manager.

Opening the second day's session, which was devoted entirely to the Residential Sales Bureau program, a skit entitled, "The Big Night," depicting sales arguments for the all-electric kitchen, was presented. This playlet, which was produced by J. Priestman and directed by F. Fatkin of the B. C. Electric Railway Co., was acted by the following employees of that company: Jim Macdonald, Dick Longmuir, Misses Chris Kerr, Maude Beech and Viola Riggall.

As a further part of the electric range program, the story of range promotion in the Tennessee Valley by the three major utility companies operating in Georgia, Alabama and Tennessee, was told by W. T. Christy, Edison General Electric Appliance Co., Atlanta, Ga.

The water heater program was introduced by a skit entitled, "A Day with the Week's Family," bringing out the sales features of automatic electric water heating. This was acted by Madge Griffiths and Harry B. Nichols of the B. C. Electric Railway Co., and directed by G. S. Dawson of that company. This was followed by an exposition of the methods used in promoting electric water heating load in The Washigton Water Power Co. by R. B. McElroy, and in the Portland General Electric Co. by Orr E. Crites. These were extemporaneous discussions and were not submitted in written form for publication.

Part of the refrigeration program was presented in the form of a skit by W. D. McKelvey and E. H. Norling of the General Electric Co., Cleveland, bringing out the food conservation value of the electric refrigerator.

The subject of promoting small appliances in the home and all lamp socket devices aside from the larger load builders was presented by J. A. Lockhart, Pacific Power & Light Co. This was an extemporaneous discussion and was not submitted in writing for publication.

To show the interest of the optometric profession in better lighting and to suggest means by which the lighting salesmen and the optometrists can cooperate for mutual advantage, Dr. Leslie R. Burdette, secretary of the Oregon Optometric Association, Salem, Ore., was invited to address the meeting in connection with the lighting part of the program. Dr. Burdette's subject was, "The Optometrist as a Lighting Salesman," and his talk is expected to be the forerunner of several local cooperative movements in the territory.

The meeting closed with a skit showing a typical home-lighting demonstration, produced by Walter E. Potter of the Incandescent Lamp Department of General Electric Co., with Miss Harriett Klumpp, Northwestern Electric Co., and Miss Corliss Guy, Puget Sound Power & Light Co., taking the parts of demonstrator and housewife respectively.

At noon on the second day, delegates to the meeting were the guests of the Vancouver Electric Club, C. T. Clarke, president, and were treated to an entertainment program that furnished a welcome interlude of relaxation between the exacting demands of two long and intensive sessions of the conference.

All other features of the program of the meeting are published in the following pages and they are commended to the attention of commercial executives and employees for further study. As chairman of the section, I want to take this opportunity to thank the bureau and committee chairmen and those taking part in the program of the section for the year 1934-35.

*Advisory Executive Council: Tom D. Fulford, Puget Sound Power & Light Co., Chairman; Chairman, Industrial and Commercial Sales Bureau, Carl L. Hoffman, The Washington Water Power Co.; Chairman, Residential Sales Bureau, Glenn L. Jackson, The California Oregon Power Co.; Chairman, Rural Sales Bureau, C. J. Hurd, Mountain States Power Co.
British Columbia Electric Railway Co., W. C. Mainwaring.
Idaho Power Co.: L. W. Brainard.
Montana Power Co.: J. C. Ryan.
Northwestern Electric Co.: George Wisting.
Pacific Power & Light Co.: Guy E. Davis.
Portland General Electric Co.: A. C. McMicken.
The Washington Water Power Co.: R. B. McElroy.

Meeting Unfavorable Competitive Factors in Developing Commercial Cooking Loads*

By A. K. GAYLORD
Northwestern Electric Co.

WITHIN the past ten years there has developed a new habit in the lives of the food buying public. They no longer demand heavy dinners. During the last four years the quick counter lunch has become popular. No doubt this change has been brought about by the increased tempo of our daily activities, by financial stress, and by the work of our food economists.

The food serving industry, from necessity, has attempted to keep in step with the habits of the buying public. This readjustment has developed a terrific competitive situation. In order to retain their position and to expand, individual establishments have had to feature better food, better ingredients, better service, more attractive surroundings and lower prices. We should be alert to capitalize on these five conditions because they have placed that dark, unattractive, and too often dirty lunch room in a classification with other industries where raw materials are transformed into products. In order for us to reach this market with our complete electric service, we must know the food serving problems and understand how and why electrical equipment will competitively meet modern cooking requirements.

There are two general divisions of commercial cooking equipment. That field in which we enjoy a minimum amount of competition, such as electric toasters and waffle irons, and the competitive field in which heavier equipment is required. This report will deal with the highly competitive field.

The conventional range, regardless of type of fuel used, has represented the major cooking unit installed in most kitchens. All food preparations were performed on this unit. Modern trends in eating have changed this until today we have a condition where highly specialized unit equipment is desirable. This is a most favorable condition for the electrical industry because of the adaptability of electricity to unit cooking equipment. To assume that the inherent advantages of electricity are sufficient to sell electrical cooking, and that there are few sales obstacles, is far from the facts.

In order to sell commercial cooking properly, a knowledge of some of the inherent sales resistance and how to overcome them is imperative. In general there are four conventional obstacles to overcome on almost every job: (1) lack of information on the part of the chef or operator; (2) cost of installation; (3) cost of B.t.u.; and (4) cost of equipment.

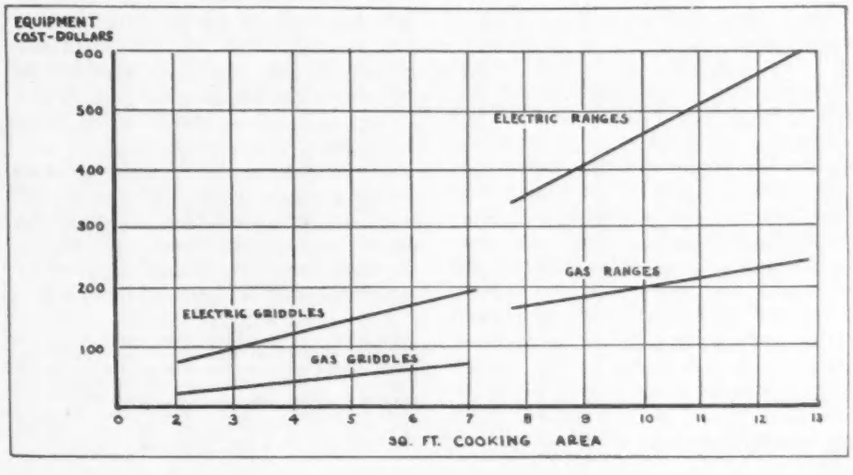
Ignorance on the part of the prospective operator as to what newly designed equipment can accomplish is a common sales resistance peculiar to most types of selling. An active consistant sales effort, giving facts on each item of equipment, is one of the best means of developing an electrically-minded cook. Actual demonstration is of first importance. By no other means can we hope to overcome that front line sales resistance of ignorance and prejudice. Seldom will an actual demonstration fail to sell a real prospect.

The problem of high installation cost is one peculiar to our service, and one which will always represent a handicap as compared to gas service. We believe that a more favorable ratio can be realized by an active participation in all code making bodies. Recent progress on the bare wire neutral promises to be a step in the right direction. The new de-ion circuit breaker should be used to simplify commercial cooking installations.

The most common and least understood sales resistance we have to overcome is the electrical B.t.u. cost. Again, with certain units of equipment we have but little sales competition due to the inherent advantage of electrical cookery, such units being the waffle iron, toaster, and silex coffee maker. As we enter the heavier field, to justify electric equipment on a B.t.u. basis would be impossible. If we are to hold, regain, and get our share of this electric cooking load, definite progress must be made toward a better ratio between the B.t.u. costs of electricity and other forms of heating. We believe that power companies are realizing the desirability of the cooking load with its unity power factor and good load characteristics.

The fourth sales obstacle is one that is real and requires all known selling methods to overcome, that is cost of electrical equipment. We grant that a sizable volume of electrical cookery has been installed, which might indicate the four obstacles to be over-emphasized, but if it were possible to designate the actual percent of installed electrical equipment to the total available cooking load, the electric would represent a small portion of the total. Electric cooking represents the best that can be offered, therefore, we should not be

Fig. 1 — Comparative costs of gas and electric commercial cooking equipment



†Carl L. Hoffman, The Washington Water Power Co., Chairman; O. C. Mayer, Idaho Power Co., Vice-chairman; Chairman, Commercial Cooking Committee, A. K. Gaylord, Northwestern Electric Co.; Chairman, Industrial Power Committee, Thomas S. Gibbes, Puget Sound Power & Light Co.; Chairman, Commercial and Industrial Lighting Committee, L. B. Gawan, Utah Power & Light Co.; Chairman, Air Conditioning Committee, H. C. Bender, The Washington Water Power Co.

*A report of the Commercial and Industrial Sales Bureau, Business Development Section.

content with a few choice loads, but plan our load building program to get a larger percentage of the total available load.

In order to understand the prospect's first reaction when we talk cost of equipment, in actual cost comparison between two types of cooking units will be of value. Since gas represents our keenest competition, we will base our charts on electric and gas equipment. Figures for both are taken from national manufacturers' catalogues. The nearest gas equivalent in terms of desired cooking area is used as a comparison in Fig. 1.

Any one of these four sales obstacles, considered alone, might indicate commercial electric cooking to be remote, if not impossible. Such is far from being the case. While they are real and definite handicaps, and this committee would recommend that continued efforts be made to overcome them, we in the electrical utilities have a story to tell that will meet all objections to electrical cooking. We need only to find a prospect who will consider his kitchen as a food factory. This type of customer will be anxious to consider the over-all advantages that can be obtained only with electric cooking equipment.

The monthly power bill should never be presented as such, but only in conjunction with a complete analysis of the entire electrical service, including all of its advantages. These advantages may be summarized as follows:

1. Control of heat, constant fuel pressure.
2. Uniform temperature, no hot or cold spots.
3. Flexibility of operation.
4. Floor space savings.
5. Less shrinkage.
6. Fuel service, no deliveries or floor space for bins.
7. Ventilation.
8. Sanitary features.
9. Fire and explosion hazards.
10. Chimney construction.
11. Maintenance.
12. Depreciation.

Each item has a dollar and cents value which, when evaluated honestly, will write off the electric bill, in part if not in its entirety. Sales opportunity lies in the proper selling of the superior advantage of electric cooking equipment. The proper telling of this story will develop within our sales engineers that essential factor which we choose to call "romance in selling." Romance in business is an essential factor to any successful sales plan. We have a story to tell and equipment to sell that strikes at the very heart of modern progress. Ours is a humanitarian service because we can actually make it possible to improve the quality of food and safeguard public health.

Commercial and Industrial Lighting Progress*

By L. B. GAWAN
Utah Power & Light Co.

THERE can be no doubt that the outstanding commercial and Industrial lighting sales development during the past several years has been the widespread awakening on the part of utility executives to the need for organized sales attention of the same type which has long been given the promotion and sale of appliances and services in the residential market. Much progress has resulted and commercial lighting sales activities particularly have advanced to a more important position in the sales program.

Analysis and experience have revealed two important points; first, the very large potential revenue available from the sale of improved lighting; and second, the comparatively moderate unit sales expense to secure such business. Much has been said in previous reports of this committee about the potential market for the sale of commercial and industrial lighting. It is the purpose of the current report to deal with the 1934-1935 developments which can be utilized to produce sales immediately.

Better Light-Better Sight Movement

The impetus provided by the nation-wide Better Light-Better Sight program which was launched in September, 1934, has marked the beginning of a widespread public appreciation of the relationship existing between proper artificial lighting and eyesight conservation. The barrage of publicity circulated nationally and that of local origin has fully awakened for the first time an interest in this important subject on the part of the householder, the educator, the student, the optical fraternity, as well as the business world in general.

Campaigns in home lighting have scored a success. The "new approach" based upon providing lighting for proper seeing conditions and utilizing the sight meter to test lighting has exposed literally millions of people to a practical trial of proper illumination. Quotas set for the filling of empty sockets raising of lamp wattages and the sales of study lamps have been greatly exceeded. It has been definitely established that when the public could really measure the condition of their home lighting, they hastened to accept improvements. One of the most interesting by-product results of this publicity has been the development and acceptance of the I.E.S. study lamp specification which has led to a complete revolution of portable lamp merchandising. This development clearly indicates that convention need not impede progress when the story is properly told. The job of selling good home lighting is by no means finished, indeed it is scarcely begun, but the success of the Better Light-Better Sight activity lies in the fact that home lighting education has at last been established on a firm foundation and vigorously publicized.

The effects of this continued publicity will be far-reaching. The next logical step is the improvement of the lighting of stores, offices and other commercial and industrial spaces. No man can enjoy the convenience of a study lamp while reading his evening newspaper without giving some thought to the lighting conditions under which he has worked during the day. Already there are many requests for surveys of store and office lighting which are directly traceable to home lighting publicity.

Now is the opportune time for organized, intelligent sales efforts which cannot fail to produce commercial lighting revenues in startling volumes. In fact the next objective of the National Better Light-Better Sight Bureau is commercial lighting.

We quote from the December 20 issue of "Better Light-Better Sight News" as follows:

> "Home lighting serves the customer for his own use and benefit. Commercial lighting serves him for his business benefit.
>
> "Commercial lighting to the merchant means the attracting of customers, the clearer showing of goods, the speeding of sales, the reduction of error by clerk and customer, fewer exchanges, more good will. The merchant at home may be very much interested in the eye conservation of his children, but in his store he is interested in accelerating the pace of his cash register. In approaching him during business hours the slogan must be changed to Better Light-Better Business."

In collaboration with this movement

* Report of the Commercial and Industrial Lighting Committee, Commercial and Industrial Sales Bureau, Business Development Section: L. B. Gawan, Chairman, Utah Power & Light Co., Ladner V. Ross, Washington Water Power Co., Orland C. Mayer, Idaho Power Co., Raymond Ackerman, Benjamin Electric Mfg. Co., Theron W. Fitch, Portland Gen. Elec. Co.

the Lighting Sales Sub-Committee, Edison Electric Institute, has prepared "The 1935 Plan For Better Commercial and Industrial Lighting," utilizing the slogan, "Better Light-Better Sight-Better Business." This book presents a very comprehensive analysis of the potential market, suggestions for commercial and industrial lighting department organization and operation, and retails the experiences and plans for the immediate future of a few utilities who have been successful in promoting the business. It also includes a prospectus of advertising materials. Your committee offers this plan book as an exhibit in connection with this report and recommends that it be carefully studied by all sales executives of member companies.

The National Housing Act

The retrenchment policy of the business world during the past several years has created an enormous market for modernization of business properties. Repairs, replacement of equipments and improvements in merchandising methods are badly needed. Millions of dollars of idle capital are now available for these purposes throughout the whole country. The Federal Housing Administration created by the National Housing Act has provided for government insured private capital to be released by local financial institutions. This means the expansion of credit and the encouragement of private enterprise. The chief objective is to restore business to its normal condition. At the tail end of a business depression and at the early stages of recovery this movement is indeed timely.

The keynote of the National Housing Act is *Modernization*. Much can be said about modernization from many angles, but when we face the question with a broad general point of view, can we satisfy ourselves that lighting has ever kept its place with process of modernizing the retail establishment, the commercial office and the manufacturing plant? Haven't we in the lighting industry played a secondary role? The salesman of elaborate store fixtures and display cases, cash registers and accounting systems, scales and other equipment calling for sizeable investment, have established in the minds of merchants, office managers, and plant operators the value and necessity of their products. But in spite of the fact that we have been at it for years there are still a large number of our commercial customers yet to be sold good lighting.

This brings us back to the point that in order to be successful our sales plans for the immediate future must be laid on a solid foundation and then vigorously publicized. Your committee believes that the national housing program is most timely and paves the way for immediate aggressive action. Good lighting is a far-reaching influence in the prosperity of the retail store and other commercial establishments, the office and the industrial plant. Publicity to promote adequate lighting should be firmly tied to the modernization movement. More modernization can be purchased with the dollar spent for lighting improvement than for most any other medium under consideration for the restoration of business. A new lighting job for the exterior and interior (correctly designed) plus a little paint means greatly improved appearance at small cost.

Among all merchants, particularly, there is a new alertness to the psychology of the buying public, a new awareness of the part that store appearance plays in gaining and holding trade. National associations of retailers are preaching the gospel of lighting to their thousands of members. Trade publications have taken up the story. National and sectional organizations operating chains of food stores, drug stores, restaurants, cigar stores and specialty shops have been putting improved lighting into their places and introducing into some of our communities standards of illumination for which our previous efforts in these localities had failed to gain recognition.

The increasing competition in all retail fields, the manifest success of chain store methods in gaining customers, the flood of new ideas in retailing and the general feeling that conditions are improving as well as rapidly changing are all operating to make the market easier to reach.

The commercial and industrial lighting market is ready to listen to our story. It is ripe for quick education and intelligent sales appeal. Modernization, Better Light-Better Sight-Better Business are definitely related to the better housing program.

Luminous Styling

Another important development is luminous styling in architecture. Both exteriors and interiors of buildings may now be designed to incorporate built-in lighting features as an integral part of the decorative scheme at a cost which compares very favorably with conventional methods of construction.

The store front offers tremendous possibilities. Many up-to-date retail establishments, employing the latest methods of display and providing every modern service, all too often present store fronts that do not live up to the needs of today. With the slogan, "Modernize for Better Business," the opportunity is evident. It is now possible to build store fronts using light as an architectural element, combined with such structural materials as stainless steel, porcelain enameled iron and luminous glass at little if any excess cost over that of good store exteriors and entrances of older designs.

Store interiors can be remodeled with lighting built-in to give a modern setting of unusual beauty at small cost. This is especially true of small stores and specialty shops. Lighting of this character can also be introduced into certain departments of the larger stores such as beauty salons, lounging rooms, cosmetic departments, optical departments, etc. Merchants welcome suggestions for modernizing such special departments at times when the relighting of the entire store may be out of the question. The suggestion of luminous features for display sets throughout the store is another opportunity not to be overlooked. There have been many examples recently of the adoption of luminous styling by gasoline filling stations. Here again keen competition demands keeping pace with the times. The beer garden, the roadside tavern, the amusement park, and numerous structures of many types afford opportunities for the aggressive lighting salesman.

It is generally appreciated that the modern brilliantly illuminated buildings brought crowds to Chicago's Century of Progress. There is much evidence that the lessons there learned are being given local application to an increasing degree. Luminous features are bringing new patronage to commercial establishments where alterations have been completed.

It is obvious that our industry should take the lead in introducing this new and revolutionary style in architecture to the architects and designers and to our customers. Each installation will mean a new and sizeable commercial load that will be in demand everyday of the year.

In February, 1934, the New Business Department of the Southern California Edison Co. issued a very attractive mailing piece to commercial customers reprinting an article entitled, "Styling Luminous Advertising in 1934." by Edward G. Neale, President, Luminous Structures Inc., Los Angeles. Installations such as those illustrated in Mr. Neale's article can be responsible for individual load increments of 15 to 25 kw. and more for individual store fronts, gasoline filling stations, and other business houses.

The same article by Mr. Neale was mentioned in the news item entitled, "Luminous Structures—A New Idea," in the "Electrical World" for September 1, 1934, with which there was

printed an article on a Texaco gasoline station which illustrated the new technique of building luminous structures. The station included 18 kw. of lighting load and the intensity secured was such that a night snap shot came out clearly for reproduction.

It should be borne in mind that luminous styling has passed from the stage of bizarre installations in big cities. Prefabricated materials are available which make practical the designing of jobs for buildings in towns of any size.

Your committee definitely recommends that the promotion of luminous styling be made a feature of the 1935 lighting sales program. It is firmly tied in with the better housing and modernization plans.

New Tools for Lighting

It's the new products we show and the new methods we use that keep sales activities alive and increase their scope. The wide variety of shapes and sizes in the present-day Mazda lamp have removed many of the former restrictions in the application of lighting. It can be placed in most any accessible location. It can be operated in any position. It can be built into the structure above the ceiling, behind the walls, or under the floor. In a broad sense it is more than a light source, it is a medium controllable in all respects. It lends itself to most any type of application required. For operation on standard voltage circuits we now have sizes from 3 watts in properly proportioned steps up to lamps of 30 and 50 kw., or in other words, from about 1½ candlepower to nearly 150,000 candlepower.

Among the new developments have been a series of tubular lamps in answer to the demand created by built-in lighting for higher wattage lineal light sources. They may be used in areas where space is limited, in modern building design, in show cases, and window signs requiring an even intensity. Several sizes are available—the 25 watt, the 40 watt, the 75 watt, the 100 watt, and the 150 watt.

The new two-filament or three-light lamps, which provide three levels of illumination, will undoubtedly find their widest application in the field of commercial lighting. They answer the need for greater flexibility, particularly in the small and medium sized establishments which have definite peaks and low points in the volume of store traffic. This flexibility feature affords the lighting salesman an opportunity to introduce higher levels of illumination in the new buildings, particularly because control of the intensity is in the hands of the operator and when he has seen the advantages of the higher levels they will be put to use.

In addition to these more common illuminants, we have at our disposal a line of gaseous conductor light sources promising new wonders. These illuminants give us a means of obtaining colored light flux in volume in a surprisingly efficient fashion. In fact the new high pressure mercury vapor lamps have an efficiency ranging from 25 to 45 lumens per watt; in other words from 1½ to 4 times as much light output as the Mazda lamp of the same wattage. These lamps will undoubtedly find wide application in industry. Though the technique of their application is not yet fully realized, each month brings us new examples of hitherto unthought of means of using such light.

More brilliant tubes employing neon and other gases have been developed and recent experiments indicate a possibility of their wider use in decorative lighting.

We have at our disposal tools and materials given us by scientific research and we as lighting salesmen have a responsibility in putting these to work to meet the needs of today. Our territory expands as we make the most of these opportunities. Rapid progress has been made of late years, extremely rapid, when compared with the past.

Promotion—Displays—Exhibits

The program for lighting education and promotion should be carefully laid out. While such a program should be broad in its scope and coverage, it will be most effective if it stresses a few fundamental ideas. From many angles these ideas may be repeated as the year progresses. Meetings, lectures, displays and exhibits, if well timed or tied in with other community enterprises, may be very effective.

For example, at Salt Lake City's Modernization Exposition in 1934, the Utah Power & Light Co., in addition to its own exhibit occupying 27,000 sq. ft. of floor space, designed two groups of model store fronts in collaboration with the exposition's architects. A generous use was made of architectural lighting features, luminous elements and the latest developments in electrical advertising. The show windows were utilized as display spaces, each rented to individual exhibitors. While the materials used in the buildings were those which lent themselves to the temporary nature of the structures, they were nevertheless, very finished in appearance. This idea was repeated on a somewhat smaller scale for the modern merchandising show at Delta, Colo. and still later at Ogden, Utah, for an industrial show. These exhibits have done much to arouse interest in the possibilities of lighting. At the annual Poultry Show a display of ultra violet lighting for the irradiation of baby chicks and laying pullets was installed. An exhibit of class room lighting was placed at the convention of the Utah Education Association. Lectures were delivered to such groups as industrial engineers, architects, and grocers associations, throughout the year.

In many sections of the Northwest there have been organized "Sight Saving Councils" or "Better Vision Institutes" for publicising the Better Light-Better Sight movement. In some cases arrangements are made with eyesight specialists for survey of lighting conditions under which their patients work.

Advertising

Sales promotion and advertising go hand in hand to pave the way for the direct sales approach. Because of the wide variety in the nature of business places and other establishments, classified as commercial or industrial customers, the sales appeal of advertising should be carefully studied. While it is true that lighting is a universal application, there is no standard appeal that fits all customers.

It is essential to group customers engaged in businesses of similar character so that the sales appeal can be analyzed from the standpoint of the uses they may have for the various lighting services and their respective values. It also aids in clarifying the picture as to the exact size of the potential market for every class of lighting load and in allocating advertising expense. An example of such classification of commercial customers is that used by Utah Power & Light Co. as follows:

Group I—Small Retail Establishments: Clothing and Shoe Stores, Drug Stores, Electrical Stores, Furniture Stores, Florists, Food Stores, Hardware, Paint and Wallpaper Stores, Jewelry Stores, Lumber and Coal Dealers, Stationery Stores, Miscellaneous Retail Establishments.

Group II—Barber and Beauty Shops, Shoe Shine and Repair Shops, Tailor Shops.

Group III—Bakeries, Restaurants, Refreshments and Confectioneries, Beer and Beverage Dispenseries, Billiard Parlors.

Group IV—Clubs and Lodges, Churches, Hospitals, Undertakers.

Group V—Theatres and Amusements.

Group VI—Apartments, Hotels and Rooming Houses, Office Buildings, Public Buildings (City, County, State and Federal), School Buildings. Financial and Real Estate Offices, Other Office Spaces.

Group VII—Wholesale Establishments.

Group VIII—Department Stores.

Group IX—Automobile Dealers (New and Used Cars), Automobile Accessory Stores and Garages, Service Stations, Tourist Camps.

Group X—Miscellaneous Commercial Customers.

There can be no doubt that direct mail advertising is one of the most

effective means of reaching a market so diversified. If the commercial customer list is brought up to date every year the resultant prospect lists will offer new opportunities for the skillful use of carefully prepared and well timed mailing pieces to pave the way for the approach of the salesman.

While "canned" mailing pieces can be used and have been used very effectively, there is also a place in the picture for localized circulars, letters, and sales material. A picture of a local competitor's store will jar a merchant into action when a much finer photograph of a store a thousand miles away may have no effect.

The local trade publications such as those of grocers or manufacturers' associations, etc. offer opportunities for advertising. Car cards and billboards can be used in connection with such general slogans as "Better Light-Better Sight-Better Business," or "Modernize Business with Better Light." It has already been mentioned that the 1935 plan book includes many samples of advertising copy.

Personalized Sales Approach

The advantages of classified customer lists mentioned above from the standpoint of directing the salesmen's efforts with minimum waste of time are too obvious to require lengthy discussion. The sales presentation made to the food store proprietor will need to be changed somewhat when the salesman approaches the school official. Insofar as it is practicable, the sales job should be laid out so that the salesman is assigned customers for coverage by classification rather than by district, in other words, let one man canvass all gasoline service stations and another all food stores, etc. In this manner each learns his customer's language in the broad sense that he organizes his sales approach more thoroughly. There is also the problem of selling through headquarters; as for example, in the case of the filling station he must contact the station operator and also general management office in many instances.

Selling by Demonstration

"Nothing sells light like light." There are many indispensible items of lighting demonstration equipment. The interior fixture standard which can be carried in a hand case and easily mounted in a few moments; the flood-lighting demonstrator; lighting sales kit and the foot-candle meter, all employ the "seeing is believing" principle —right in the owner's store, office or factory. A very effective aid to the lighting salesman is a portfolio made up of "before and after" photographs of lighting jobs sold and installed, preferably by his own company. The Westinghouse company has made available a "Lighting Sales Album" which presents a most practical, convincing and interesting sales story for various types of business and industrial institutions.

Lighting the Small Store

A very sizeable percentage of commercial customers operate small retail establishments. Many of these are neighborhood stores or stores in small communities. It is often contended that they will not repay intensive and extensive personal sales effort. We should, however, grasp the fact that it is often only necessary to sell one or two stores in a small town or neighborhood in order to bring all of the others into line in a short time. We should bear down heavily on the job of getting one good lighting installation of the small store class into every neighborhood, district or small town this year.

Analysis made in one district having 3,698 commercial accounts revealed that 428 of these were food stores. Direct sales effort had not produced satisfactory results with that list over a period of two years except with the chain-owned food stores, which were about 10 per cent of the total number. Further study showed that about 250 of these establishments were members of the Independent Grocers' Alliance (IGA) or the Red and White Stores Association. Member stores of these organizations are individually owned but use a collective system of buying and advertising. Both maintain headquarters personnel for the study and dissemination of better merchandising methods. Contacts here proved to be profitable. An offer was made by the lighting service bureau of the utility company to prepare lighting manuals suitable as a guide for specifying proper illumination for these stores. These two publications were supplied, the titles being, "IGA Store Lighting Manual" and "Red and White Store Lighting Manual." A total of 300 copies were delivered to the headquarters offices and from there distributed with appropriate letters over the signature of association officials stressing the importance of adequate lighting and the free lighting service of the utility company. Proper follow-up produced 30 sales with added load of 79.8 kw. valued at $58 each per year.

It was found also that nearly all food store owners and operators are members of the local Retail Grocers' Association and arrangements were made with their secretaries for talks on food store lighting to be delivered at their regular meetings. This same organization later sponsored a christmas lighting contest for food stores. There were 210 contestants. Prizes were salable merchandise given by the food brokers. As a further follow-up an attractive mailing circular has been prepared displaying the photographs and comments of satisfied owners who have recently improved their lighting.

The Idaho Power Co. arranged meetings in the smaller communities, usually in the company store, at which the principles of proper commercial lighting could be effectively demonstrated to local merchants prior to sales visits in their individual stores. While the speakers were in each town, several non-commercial talks before business clubs were usually scheduled for them.

Trend Toward Indirect Lighting

There is a definite trend toward indirect lighting for department stores, banks, offices, schools, clubs and churches which offers tremendous possibilities for load increases. Many of the most prominent department stores throughout the country have changed from direct to indirect lighting. Others are rapidly following example. Store managers, quick to appreciate that more light helps sales, have striven for higher and higher intensities of illumination. With direct systems higher wattage lamps have introduced glare. When lighting from concealed sources is introtroduced they realize that the store seems larger and more pleasing in appearance.

In the office lighting field successful sales have been made utilizing the indirect floor lamp or the detachable indirect wall urn in many cases.

Outdoor Commercial Lighting

One field which offers a great deal of promise for 1935 is the selling of outdoor lighting to stores, banks, hotels, garages, gasoline stations, road side stands, tourist camps, swimming pools, tennis courts, athletic fields, etc. Much could be said about this important field but space will not permit its discussion. The manufacturers of outdoor lighting equipment have made available data on sales methods, layouts, promotional materials, etc. which will provide utility companies with plenty of ammunition to produce results.

Changing Industrial Picture

Much has been said and written about the economics of good lighting in the industrial plant. Many of us have had interesting local experiences, but in the opinion of your committee the story of the changing picture is best told in a paper presented by Messrs. Ward Harrison and C. E. Weitz at the Conference on Economics of Applied Lighting, Case School of Applied Science, February 8-9, 1933. We quote the following paragraphs:

"Despite scientific management theories, elaborate cost analyses and accounting, and searching methods of efficiency attainment, successful industrial operation oftentimes demands an extreme alertness and a quick change of pace in order to jockey into favorable position in the competitive race for markets. How does light fit into such a changing pattern of industrial production and economics? How much and in what form will it yield a return for its investment and operating cost? These two questions, I take it, are the ones to which answers are sought. Unless our views of modern lighting practice can be logically fitted and meshed with factory management viewpoint to mutual advantage, a generation of research in lighting, of engineering dedelopment and hopes for future advanced lighting products might just as well be scrapped, or abandoned.

"There are many industrial executives who today are convinced of the economy of making certain radical changes and improvements in their plants. They know that such changes would prove profitable but the initial expenditure involved places these improvements beyond their reach, especially in times like these. On the other hand, the investment required for a good lighting system is very small in comparison with that required for other plant changes, and the first conclusion I wish to draw, therefore, is that if an industrialist is convinced of the economy of having a good lighting installation, there is but little excuse for his not having it."

To summarize the principle points of this discussion the following conclusions are reached:

1. All plants must have provision for some artificial lighting.

2. The difference between the cost of poor lighting and good lighting is so small that judged either from the standpoint of investment required or operating expense no plant management can justify being without good lighting if they believe it will pay.

3. Good light affects so many factors in the cost of manufacturing, and all of them favorably, that the conclusion that it is worth more than it costs appears almost inescapable.

Selling the Value of a Service

Our 1935 commercial and industrial sales program should be built around the premise that we are going out to sell better lighting to every customer. Although it should be one of direct sales effort, supported by promotional features and advertising, we should bear in mind that our success is tied up with the success of our customers. We should endeavor to be helpful to our customers in a broad way.

If utilities are in any difficulty today it is because of a lack of understanding on the part of the customer of the true value of the electric service rendered. He has not appraised its value in the terms of a profit-producing agency. The expense of electric service is not on the proper side of the ledger. Our plans should embrace the rendering of a service which will help the utility in its relationship with the customer—a relationship on a consulting basis rather than one of mere energy sales. If services or facilities have been sold which do not properly fulfill their function, they should be removed or replaced. If rates are not designed to promote the adequate use of service they should be revised.

Each commercial and industrial lighting sales representative should be equipped through training, experience and broad knowledge of electrical problems that he may be accepted as a consultant by the customer rather than to be looked upon merely as a salesman. He should be expected to develop through personal contacts, a confidence to the extent that the customer will feel free to call upon him with respect to any question that may arise concerning himself and the company or any of his electrical problems.

Building the Small Industrial Heating Load*

By J. C. MUNRO
B. C. Electric Railway Co., Ltd.

THE use of electricity for heat has developed a sales problem which, in many respects, is quite different from that involved in building the ordinary light and power load. For example, compared with lighting and mechanical power, heating is a highly competitive field and the use of several other fuels, such as gas, oil, wood and coal have become well entrenched in the minds and habits of our customers. It seems somewhat of a paradox that electric heat, which is a most efficient form of energy conversion, should be subject to greater competition than say, electric light, which is, as we all know, most inefficient.

Another feature of electric heat is that its potential applications are not nearly so self-evident as those of ordinary light and power. Every building must have light and practically every industry uses mechanical power. Building the lighting load is a matter of the degree of illumination which can be sold. When every mechanical operation is motor driven the ordinary power field is saturated. Mechanical operations and lighting appeal to the eye and are readily discernible. In the case of heat, however, it is often used in many unseen and inconspicuous ways and locations.

There are several kinds of lighting units, a few different types of electric motors, but there are literally hundreds of different kinds of heating apparatus. Moreover the correct use of heat involves a knowledge of metallurgical, chemical and physical phenomena. An understanding of the advantages and limitations of the various fuels used to produce heat is required. Thus, the sale of electric heat means considerably more than just the calculation of the amount of energy required to produce a given amount of heat.

In view of the above distinctive characteristics of electric heating. I feel that they should be fully realized and allowed for in any campaign or sales plan designed to increase the commercial heating load, particularly among the smaller appliances. It therefore seems desirable that a comprehensive sales plan should involve:

1. Locating the prospects.
2. A good knowledge of competitive fuels.
3. The services of a competent sales engineer, with up-to-date and complete knowledge of the applications, limitations and advantages of electric heating.
4. Co-operation with and from manufacturers of electric heating equipment.

This paper proposes to deal more fully with the first of the above mentioned items, namely, locating the prospects.

Before any intelligent selling can be undertaken, prospects are necessary. In the case of my own company, the question was: Shall we attempt to sell prospects as they are located, or shall we locate them as quickly as possible and

* A report of the Industrial Power Committee, Commercial and Industrial Sales Bureau, Business Development Section.

then concentrate upon the most promising? In arriving at a decision we were assisted greatly by several N.E.L.A. bulletins issued by the power committee, which outlined the experience of other power companies.

It was deemed advisable to make a complete survey of all industrial heating processes first. Comparatively little attempt was made to sell, unless it was evident that a sale could be closed quickly. This method had several advantages. It was not necessary to use qualified heating engineers to carry out the survey. A close idea of the potential load was secured in a comparatively short time. By classifying the results of the survey we were able to obtain useful mailing and calling lists, the prospects for the various appliances available, and a very complete picture of the competition involved. The survey resulted in valuable information for a follow-up by more expert heating engineers. It also revealed the present operating costs of competitive fuels and thus afforded the opportunity of scrutinizing our rates from this angle.

Arranging for the survey included the following details:

1. Preparation of lists of all industrial consumers under headings. (See Table I).
2. Preparation of survey data sheets for the use and guidance of field men. (A copy of this data sheet is shown herewith).
3. Providing of summary sheets of various kinds which enabled us to determine the potential load in all industries and the prospective demand for all types of heating equipment. These summary sheets, were, of course, compiled from the survey data sheets. (A summary sheet for the woodworking industry is shown herewith).
5. The writing of advance letters sent to each consumer a few days before the field man's call. It is felt that the careful wording of this letter accomplished much in paving the way for the field men's calls.
5. A short course of instruction for the field men.

The plan worked smoothly and we can heartily recommend it. Of the 1,429 premises surveyed, in all but two cases our field men were given complete information and access to the premises. We were fortunate in having field men with keen powers of observation and of good personality.

Although the survey was not primarily an attempt to sell, sufficient annual heating revenue was added by the field men to pay the cost of the survey three times over.

The survey indicated coal and coke, gas, oil and wood as our most serious competitors. (See Table II.) As our company also sells gas, we do not view this competition as seriously as many power companies do. Oil is an outstanding competitor in the heating field at the moment, due to the rapid increase in its use. Oil prices, however, are considerably higher than in the United States and have probably reached their minimum cost. Power companies, on the other hand, have steadily reduced rates.

It is needless to stress the necessity of maintaining a fully qualified technical staff for selling electric heating.

A great deal of information remains to be gathered and distributed to the industry regarding operating costs and results of many electric heating installations.

Table I — Results of Heating Survey

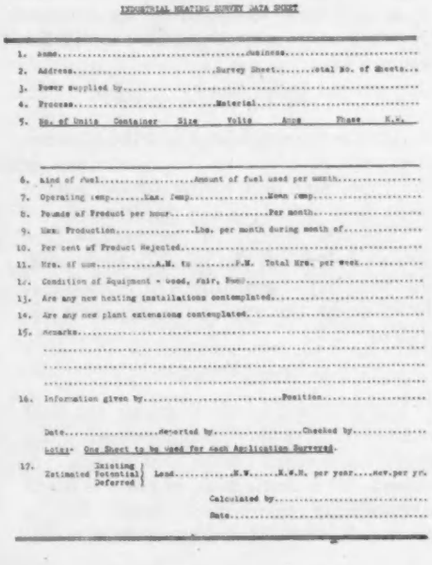
Classification	Premises Surveyed	Heating Applications Surveyed	Potential Load in Kw. Gas	Potential Load in Kw. Other Fuels	Potential Load in Kw. Total	Potential Kw.-Hr. per Year Gas	Potential Kw.-Hr. per Year Other Fuels	Potential Kw.-Hr. per Year Total
No. 1—Woodworking ..	165	255	98.58	647.13	745.71	73,708	951,005	1,024,713
No. 7—Miscellaneous	132	242	180.93	57.8	238.73	143,214	55,547	198,761
No. 2—Metal	303	664	1,678.24	13,034.65	14,712.89	1,670,752	13,848,064	15,518,816
No. 6—Restaurants	232	919	3,348.17	3,752.47	7,100.64	5,635,177	7,627,863	13,263,040
No. 4—Printing...	129	231	382.26	155.3	537.56	420,228	228,935	649,163
No. 3—Chemical...	196	493	877.87	557	1,434.87	963,549	724,757	1,688,306
No. 5—Bakeries...	271	443	1,719.85	2,895.15	4,615.0	1,783,468.5	4,456,534	6,240,002.5
Total.....	1,429	3,247	8,285.90	21,099.50	29,385.40	10,690,096.5	27,892,705	38,582,801.5

With regard to co-operation between the power company and the electrical manufacturers, I am glad to say that we receive this very readily and endeavor to reciprocate in like manner.

Experience indicates that power companies, such as ours, should concentrate upon the installation of reliable, ready-built and proven equipment, rather than experiment by attempting to design or build apparatus. In some instances, however, a frank acknowledgement of the limitations of apparatus is equally as desirable as advice regarding its advantages. In one piece of heating equipment, having a wide field in our territory, at least two years' sales efforts were lost due to the use of a thermostat of unsuitable design. I realize, of course, that electrical manufacturers are continually striving towards perfection in their electric heating equipment. On the other hand defective apparatus, particularly where a large potential market exists, is disastrous to the best laid sales plan.

Rates for the small electric heating load, in many cases, have "just growed." The heating equipment is usually served through existing light or power meters

Fig. 1—Survey data sheet for industrial heating



INDUSTRIAL HEATING SURVEY DATA SHEET

1. Name.....Business.....
2. Address.....Survey Sheet.....otal No. of Sheets...
3. Power supplied by.....
4. Process.....Material.....
5. No. of Units Container Size Volts Amps Phase K.W.

6. Kind of Fuel.....Amount of fuel used per month.....
7. Operating temp.....Max. Temp.....Mean temp.....
8. Pounds of Product per hour.....Per month.....
9. Max. Production.....Lbs. per month during month of.....
10. Per cent of Product Rejected.....
11. Hrs. of use.....A.M. to .....P.M. Total Hrs. per week.....
12. Condition of Equipment - Used, Fair, New.....
13. Are any new heating installations contemplated.....
14. Are any new plant extensions contemplated.....
15. Remarks.....
16. Information given by.....Position.....

Date.....Reported by.....Checked by.....

Note: One Sheet to be used for each Application Surveyed.

17. Existing / Estimated Potential / Deferred } Load.....K.W.....K.W.H. per year....Rev.per yr.

Calculated by.....

Date.....

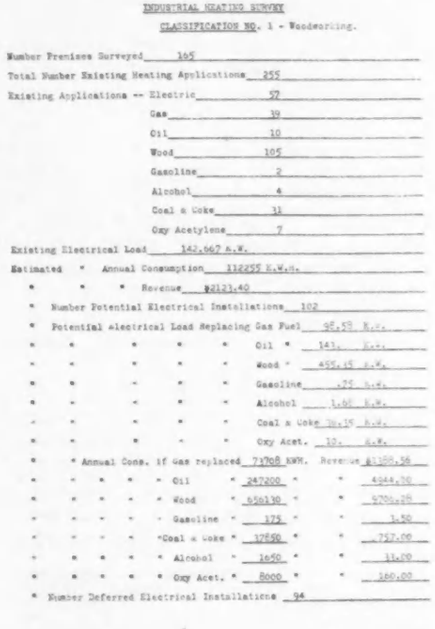
Table II — Results of Industrial Heating Survey

Potential Electrical Load Showing Fuel Used at Present

Fuel	Kw.	Kw.-hr. per Annum
Oil	6,335.900	10,439,780
Wood	2,389.550	3,487,492
Gasoline	56.950	17,722
Coal and Coke.....	12,171.920	13,842,431
Oxy Acetylene	139.500	102,630
Alcohol	1.680	1,650
Gas	8,285.900	10,690,096
Total.....	29,385.400	38,582,801

Total potential revenue at existing rates—603,636.92 per year.
Premises surveyed—1,429.
Heating processes surveyed—3,249.

Fig. 2—Form showing tabulated results of heating survey



INDUSTRIAL HEATING SURVEY

CLASSIFICATION NO. 1 - Woodworking.

Number Premises Surveyed 165
Total Number Existing Heating Applications 255
Existing Applications -- Electric 57
Gas 39
Oil 10
Wood 105
Gasoline 2
Alcohol 4
Coal & Coke 11
Oxy Acetylene 7
Existing Electrical Load 142.667 K.W.
Estimated " Annual Consumption 112255 K.W.H.
" " " Revenue $2121.40
" Number Potential Electrical Installations 102
" Potential electrical Load Replacing Gas Fuel 98.59 K.W.
" " " " " Oil " 141. K.W.
" " " " " Wood " 495.15 K.W.
" " " " " Gasoline .75 K.W.
" " " " " Alcohol 1.68 K.W.
" " " " " Coal & Coke 38.15 K.W.
" " " " " Oxy Acet. 10. K.W.
" " Annual Cons. if Gas replaced 71708 KWH. Revenue $1350.36
" " " " " Oil " 247200 " " 4644.36
" " " " " Wood " 458130 " " 8700.28
" " " " " Gasoline " 175 " " 1.50
" " " " " Coal & Coke " 17850 " " 737.00
" " " " " Alcohol " 1650 " " 11.09
" " " " " Oxy Acet. " 8000 " " 160.00
" Number Deferred Electrical Installations 94

and therefore, except in the larger units, such as bake ovens, special rates are not feasible. In our lighting rates, which are of the Wright demand type, using assessed demand, no increase in demand is made for heating equipment. We have found that power customers, whose motors do not consume energy to the value of the minimum charge, can quite often install electric heating equipment to advantage.

The first cost of electric heating apparatus, particularly during times when capital expenditure has been cut to the bone, has undoubtedly slowed up electric heating sales. In a number of instances, particularly in the metal industries, the heating equipment operates at a low monthly load factor. Under such conditions the rates earned are usually not as low as can normally be expected.

The picture is not without its bright side, however. Curtailment of expenses has resulted in the wearing out of much existing heating apparatus. This is an opportunity for the heating engineer.

At the moment there appears to be a definite trend toward improvement in business conditions. My suggestion is: "Let's survey the market and get busy!"

How to Obtain Large Industrial Heating Load*

By G. ALVIN HOWARTH
Utah Power & Light Co.

PROSPECTS for industrial heating will very seldom come in and ask for information unless there has been some artificial stimulus such as direct mail advertising. Therefore most prospects must be obtained by direct personal contact. The first thing to bear in mind is that it is strictly a sales job and we must treat it as such. To do this we must first instill in the prospect a degree of confidence that will prompt him to adopt our recommendation. This of course depends largely on the personality of the seller. There is no set rule under which this may be developed, except "be yourself and develop your own individual selling methods." You cannot gain the confidence of a prospect except by being sincere. There are plenty of salesmen who gain the prospect's confidence and sell him something that does not fit his condition, thereby losing the additional business that may have been obtained.

I think the best way to sell any piece of equipment is to first put yourself in the other fellow's shoes, so to speak. Forget your own desire to sell the equipment. Weigh the facts. If you, with your knowledge of the subject, cannot sell yourself, don't try to sell it to some one else. If you do, the customer will sooner or later find out that the piece of equipment was not suited to his needs and you will then have destroyed his confidence in you and your company.

Don't attempt to sell any piece of equipment to your prospect unless the nature or volume of his business justifies the expense. Don't sell too large or elaborate equipment. Don't persuade your prospect to use electric fuel unless you can honestly justify its use in preference to other fuel. If, after a careful analysis of the job, you decide it is not a good one for electric heat, don't spend too much time on it. Work on something more attractive.

One way to win a customer's confidence is to render him a service. If he is considering a piece of equipment, help him to decide whether it is the type and size suited for his needs. Tell him of other places where they are using similar equipment and if possible show him these installations. Let him talk to the men operating the equipment. Help him to figure the relative costs of different methods of heating. If you don't your competitor will, and he may not show yours to the best advantage.

One of the first things an industrial heating salesman must know is how to talk "the language of his prospect." Try to express yourself, using terms he would use. A distinct advantage in selling is to know more than your prospect about the subject. The average plant official is too busy to devote time to a salesman who cannot assist him with information of some sort.

In considering industrial electric heating for any purpose, the problems the heating salesman must consider are:

1. In general, is the process an application for electric heat?
2. What type of equipment should be used?
3. Cost analysis.

The use of electric heat generally is warranted when careful analysis indicates that one or more of the following conditions prevail:

1. When, due to opportunity for more efficient application, it is actually found to be cheaper than other methods.
2. Where it speeds up production thus reducing unit costs.
3. When the overall costs are cheapened due to lower labor expense, elimination of rejects or reduction in fixed costs of equipment, auxiliaries or floor space.
4. When its possible higher cost is justified because of improvement in product.
5. When the possible higher cost is warranted because of improved living or working conditions, safety, convenience, cleanliness, dependability or accuracy of control.
6. When operating costs are of minor importance compared to the results to be accomplished.
7. Where other forms of heat cannot be applied.

After it has been determined that the process on electric heat is applicable too, then a general summation of the information regarding the process and equipment should be made, as for instance in the case of an annealing furnace:

1. Process (annealing of steel).
2. Maximum temperature.
3. Material to be heated and sizes.
4. Efficiency of loading (lbs. per cu. ft., etc.).
5. Complete heating cycle.
6. Production (lbs. per hour, per day).
7. Working schedule (hours per day, days per week).
8. Voltage, phase, of circuits available.
9. Size and type of oven now using.
10. Present method of heating and handling, including costs.
11. Size and type of furnace desired.
12. Electric rate that will be charged for power for application.
13. General information.

It must be remembered that each job is a different application, as no two plants do the same thing in exactly the same way.

Type of Equipment

After a thorough study of the process, the next problem to be determined is the type, size and rating of the equipment best suited to the application.

Often the nature of the process, the size and shape of the parts to be heated, the production schedule will immediately describe the type of equipment required.

Cost Analysis

The desirability of electricity for heat treatment is today unquestioned from every standpoint except that of cost. A superficial investigation of costs is often unfavorable to electric heat. But a thorough study of the many factors en-

* A report of the Industrial Power Committee, Commercial and Industrial Sales Bureau, Business Development Section.

tering into the heating cost of a product usually presents the opposite picture.

The preparation of comparative heating costs is a difficult problem involving many factors that are often overlooked or disregarded. This can be better appreciated when we consider on the one hand that the total cost of electricity for heat treating a product is usually less than 1 per cent of its total cost, and on the other hand the quality of the product is widely influenced by the character of the heat source.

That the cost of electricity is only one of the many items in heat treating costs will be gained by a brief consideration of the following items:

1. Cost of heat source.
2. Labor.
3. Interest, depreciation and obsolescence.
4. Maintenance—continuity of service.
5. Quality—rejects, subsequent operation.
6. Working conditions.
7. Advertising features.

Cost of heat source—Costs of electricity versus fuel based on a B.t.u. value, does not give the full story as electricity is operated at 100 per cent efficiency and fuel efficiency varies with the burner and stack losses. The standby losses of electric equipment is generally much less than that for fuel fired and this alone may be a greater factor in operating costs than full load efficiency.

Labor—Electric heating devices being automatically controlled do not require attendance. The ease of placing electric heat where needed and absence of flames and products of combustion tending to hasten the destruction of the metal parts of the equipment eliminate labor costs. The low-heat losses, absence of noise and smoke, and safety of electric equipment, have removed all limitations, so that furnaces may be located in the line of production or in the shop where needed, thereby eliminating labor to handle material. Since electric heat may permit a new arrangement of machines with resulting savings, this may be taken into account in favor of the electric costs.

Interest, Depreciation and Obsolescence—The first cost of electric heating devices may be high, but in considering other types we should take into consideration all auxiliary devices, stacks, etc., as well as floor space occupied by the complete equipment. Depreciation and obsolescence items vary widely with the character of the equipment, usually electrically heated devices have a lower depreciation.

Maintenance—Continuity of Service—Maintenance should include, in addition to the heating equipment, the maintenance of all auxiliary devices. Annealing boxes and muffles are required on many fuel fired furnaces. Maintenance is reduced to a minimum in electric devices since there is an absence of high temperature flames with corrosive action on brick, and other furnace wall materials.

Quality, Rejects, Subsequent Operation—Heating often imparts entirely new physical properties to a product. It is well known that these properties are widely influenced by the nature of the heating operation. Essentials of proper heat treatment are uniform temperatures, distribution, accurate temperature control, operation on a proper time cycle, and uniform results. Electricity fulfills these requirements better than any other type of fuel. Quality of the product as directly effecting the costs of manufacturing are rejects and re-processing, subsequent cleaning operations, subsequent machining operations. inspection, and complaints. Variations in these items of expense in many cases far exceeds the cost of electricity.

Working Conditions—Improved working conditions in the vicinity of electric equipment in the elimination of heat, smoke, noise, and gases tend to show a saving in the increased efficiency of labor together with greater comfort, safety, better loyalty, cooperation, and lower labor turnover.

Advertising Features—The public is becoming more electrically minded; therefore, a manufacturer may describe the superior qualities of electrically made merchandise in his advertising.

Electric Melting of Iron and Brass*

By E. E. SCOFIELD
The Washington Water Power Co.

ALTHOUGH the electric furnace has long been established in the production of high grade steel, its use in the making of grey iron castings has been comparatively recent. During the World War there was a shortage of pig iron and at that time electric furnaces were first used to produce a synthetic pig iron from steel scrap. From this inauspicious beginning, the electric furnace has made rapid strides in the field of melting grey iron.

The application of the electric furnace to the making of grey iron is principally in the production of special irons having characteristics which cannot be obtained with the cupola furnace. These characteristics are obtained not only from iron having the same chemical content as cupola iron, but also through the addition of sundry alloys. Much has been written concerning these characteristics, and this information is readily available to anyone interested. Perhaps the outstanding achievement is the production of electric cast iron with tensile strengths of from 45,000 to 65,000 lb. per sq. in. as compared with cupola cast iron, usually ranging from 15,000 to 20,000 lb. per sq. in.

There are three types of electric furnaces in use today; the direct arc, the indirect arc and the induction types. The direct arc furnace uses the charge as an electric conductor; the indirect arc furnace has the arc maintained entirely above and out of contact with the charge, and the induction furnace employs no arc at all but depends upon current induced in the charge through mutual induction as between the primary and secondary of a transformer. Each type has its advantages and disadvantages, so that the choice must be left to the peculiar conditions confronting the purchaser.

Two processes are in use today in foundries using electric furnaces, one called the "duplex" process and the other, the "cold melt" process. Both are applicable to continuous or batch melting. In the "duplex" process, the iron is first melted in a cupola and the molten metal transferred to an electric furnace where it is refined, alloyed and super-heated before pouring. In the "cold melt" process, the entire operation is carried on in the electric furnace. Either process can produce the same quality casting so that the choice of process will depend upon plant and local conditions. The "duplex" process would seem to be preferable in a foundry having a large and steady daily capacity and in a locality where electric power costs are comparatively high and coke costs relatively low.

The operating cost data for the electric furnace is readily available from furnace manufacturers and foundries where such furnaces have been installed.

* A report of the Industrial Power Committee, Commercial and Industrial Sales Bureau, Business Development Section.

For the "cold melt" process, the operating cost including charge, refractories, electrodes, power, labor and all, appears to average about $25 per ton, the power item alone being $6.50 for 550 kw.-hr. With the "duplex" process, only about 90 kw.-hr. per ton are required, with a corresponding decrease in refractory and electrode costs.

The demand load of an electric furnace is dependent on the melting time. A few years ago furnaces averaged 250 kva. per ton of charge, but at the present time the installed capacity is generally higher and demands of 500 to 1,000 kva. per ton are used. The furnace manufacturers have made many improvements in the electrical characteristics of their product so that power factors of from 80 per cent to 90 per cent can be maintained and all serious load fluctuations smoothed out to well within good transmission operating limits.

There is no question that in the near future the electric furnace will be used almost exclusively in the production of high grade grey iron castings. These castings are not only vastly superior to the cupola product, but with the addition of certain alloys, they are rapidly displacing drop-forged and other steel.

The application of the electric furnace to the melting of brass was one of the first ventures of electricity into the commercial field. Due to the volatile nature of some elements of the brass mixture and due to the necessity of maintaining a definite composition, brass was first produced in a retort furnace. The very low thermal efficiency of the retort furnace was an easy competitor for electricity as soon as it could be sold for less than 5c per kw.-hr. and by the time of the World War there were in this country several electric furnaces melting brass on a commercial basis. Since then, electric furnaces have been installed in practically all foundries where brass is melted in quantity and where high grade castings are necessary.

Besides meeting fuel competition on a B.t.u. basis, the electric furnace permits almost complete control of any brass mixture at all times. There is little oxidation and loss of metal by evaporation so that there is a considerable saving in alloy cost. Also, the brass mixture is more readily brought to high temperatures in the electric furnace, and this super-heating gives a most superior casting.

Only the indirect arc and the induction type furnaces can be used for melting brass, the former being the one most commonly used today. Usually these furnaces are operated in batteries of several small units.

Electric brass melting furnaces are available in almost any size desired. They average about 400 kw. per ton of charge, consume from 270 to 300 kw.-hr. per ton melted, and are generally similar in electrical characteristics to the furnaces used for grey iron melting as heretofore described.

The operating costs, including charge, of electric brass melting appear to range between $22 and $24 per ton poured. Of this amount, $4.05 represent 275 kw.-hr. of electrical energy consumed.

It is very evident from this brief sketch that electrical melting equipment will be used sooner or later by all foundries catering to a trade requiring high grade or special castings. Also it is encouraging to those who sell electricity that such load can be secured at profitable rates and commensurate with the rates charged for other similar electrical loads. With this bright outlook confronting those of us interested in this phase of business development, it should not be difficult to devise sundry and effective sales methods for the promotion of the electric furnace among the foundry men of the Northwest.

Progress in Air Conditioning*

By H. C. BENDER
The Washington Water Power Co.

FUNDAMENTALLY air conditioning is a sound business. It satisfies every basic appeal by which every product is measured. Everyone can appreciate it, everyone can feel it, everyone can read about it, everyone can contact it, everyone can secure the benefits it offers and everyone can afford it in some form.

The air conditioning industry seems to be fulfilling early promises that it would develop into one of our leading industries. At the present rate of development this promise is nearer at hand than the most optimistic dared to prophesy. There was more dollar volume of air conditioning equipment sold in 1933 than in the previous history of the industry. This volume was around ten million dollars. In 1934 there was twenty million sold, and the industry has set its goal at forty million dollars for 1935. Few industries are doubling their business each year in these times. Certainly air conditioning is on its way, and there is every reason to put our faith in its development.

This development has taken place under the most adverse conditions possible. When most of us were frantically attempting to keep our business from slipping, this baby industry was gaining ground. Every new business has to start at some time and we are fortunate that the air conditioning industry started under such trying conditions, for I am sure it has tended to keep it on an even keel.

There are some who still feel that the major development of this business will be in the south where cooling is a factor, but fortunately for those of us in the electrical industry, there is no favored section and no favored industry which is free from its requirements and its benefits. Air conditioning can do for any family or any industry what the automobile has accomplished for transportation, the electric refrigerator for the preservation of foods, and the electric range for cookery.

We are going to have air conditioning presented to us this year as never before. The railroads alone will give thirty-three million demonstrations in 1935. The theatres will give forty million demonstrations weekly in air conditioned houses. The air conditioned stores will account for more millions of demonstrations.

It seems essential that all new industries have certain growing pains. Most of you recall the early difficulty of selling the electric range, electric water heater and even the electric refrigerator. I believe the utilities will enter this new industry with a wealth of background no one else possesses and make of it a load builder which will outstrip anything we now have. In our commercial organizations we have hundreds of salesmen selling hundreds of appliances but you can count on the fingers of one hand the number of men in all the affiliated companies of our Northwest Electric Light and Power Association working on air conditioning.

To show how vital this air conditioning industry is to the utilities, I quote from "Barron's National Financial Weekly" for December 3, 1934: "Upon the $2,000,000,000 estimated investment in all types of air conditioning over the next decade there should develop a replacement and service market of some $350,000,000 annually, or 17½ per cent of the capital outlay. The best

* A report of the Commercial and Industrial Sales Bureau, Business Development Section.

guess is that the division will be about as follows 10 years hence:

Electricity and steam	$300,000,000
Water	10,000,000
Refrigerant replacement	20,000,000
Filter replacement	18,000,000
Fan belts, etc.	2,000,000
Total	$350,000,000

We have attempted to present before you in previous years the six-point subject of air conditioning—heating, humidification, air motion, air cleaning, cooling, and dehumidification. That is, we have spread our efforts attempting to give you a general picture. We are taking it for granted this year that we have all assimilated in one form or another a general picture of the industry, although it is changing so rapidly that unless we are watching it constantly we soon lag behind and our notions become antiques.

This year we are presenting just one phase of the first of the six points of air conditioning—electric space heating. Perhaps the reason for choosing this one item is that it has received considerable publicity of late as one of the uses to which we may put some of our available kilowatt-hours.

Our approach to the problem of space heating must be sane. We certainly cannot be led by the politicians who would have us heating all the homes in creation, forgetting that we will have for many generations abundant supplies of wood and coal and other sources of heat and that we will always have competition. These men would have you believe that all the fuel dealers will discharge their forces and quietly close shop and move to a warmer climate. We heated water long before electricity was known and we ate cooked foods before the electric range was developed and, unfortunately for us, there are still too many who think they can continue to do these chores without electricity. Likewise, we will continue to heat our homes by other means for sometime to come.

There are several reasons why the picture of space heating with electric current is changing. The first item influencing this change is the development of insulation materials and construction methods. The second reason is the development of control apparatus so that there is no over run and accompanying waste. The third item is the development of the heaters themselves.

The Pacific Gas and Electric Co. has been the pioneer western utility in the development of this load and has at this writing over 550,000 hp. of connected space heating. This load is made up of churches, lodges, hospitals, apartments, homes and over 150 schools.

One of the firms that has done more to assist the utilities to accomplish this development of electric heating is the Wesix Company. Thomas J. Mellon, Sales Manager of the North Wesix Electric Company of Seattle, will present the subject, "Development of Electric Heat in Air Conditioning."

NOTE: Mr. Mellon presented the paper on "Electric Heat as it Affects Air Conditioning,"* written by Arthur J. Kercher, Consulting Electrical Engineer of Berkeley, Cal. Mr. Mellon prefaced the paper by pointing to a very definite market for electric heat here in the Northwest. He stated that there were very few industries or commercial businesses or homes which did not have a place for auxiliary electric heat; that with insulation and automatic control, electric heat was a competitor of any type of heat and when all the costs and economies were evaluated it could be shown that electric heat would actually show a saving; that the development of electric heat should be engineered with as much care as any other type of heat. Speaking of utility cooperation, he was convinced that there is a large undeveloped potential market which has been frowned at to date. Some utilities are actively promoting this business because they have found a group of customers who want the advantages of electric heat and are willing to pay a premium for these advantages, though frequently electric heat proved an economy.

PROGRESS REPORT

In attempting to gather data to present in this report I was met on every hand with the statement that little or no data on air conditioning sales was available in the Northwest. The Pacific Power and Light Co. has started. No other utility presented any figures, so all I can do in reporting progress is to cite some figures we compiled for The Washington Water Power Co. In 1933, the first full year of our air conditioning figures, we showed a total of 125 hp. connected and for 1934, 339 hp., not including the electric heating at Coulee Dam, which I will detail later in this paper. There are a few interesting figures brought out which tend to show the trend of the development of this load in our territory.

In Spokane oil burners showed a 25 per cent decrease over 1933, stoker sales showed practically no change whereas the little furnace blower fan, ranging from ¼ to ½ hp. showed an increase of about 800 per cent. In 1932 and 1933 in Spokane only, there were twelve of these units sold each year and ninety-three were sold in 1934.

The total load in air conditioning connected in Spokane for 1933 was 82 hp., and for 1934, 145 hp., almost double. The figures for the entire system show a connected load for 1934 of more than double that connected in 1933.

The Pacific Power and Light Co., the only utility reporting, shows for its system the following connected load for 1934:

79 Stokers	31¼ Hp.
82 oil Burners	18⅔ Hp.
59 Fans	36⅞ Hp.
25 Unit Coolers	32⅞ Hp.
Total	119¾ Hp.

No figures for previous years are available so no comparisons can be made. The point to be brought out is that this load warrants any utility to get behind it and push it.

A chart (exhibited during presentation of the report) published recently by "Heating and Ventilating" bears out the conclusion that our homes offer the first market and our results in Spokane seem to justify this statement. It will be noted that the warm air heating jobs predominate in the Pacific Northwest as compared to the averages for the United States. The way for the home owner to get the quickest results from four points of the six-point air conditioning problem is to add filters and blowers and humidity control to these warm air furnaces. These individual jobs will add from ¼ to ¾ hp. load that should operate continually or nearly so to every furnace job. In St. Louis they are featuring this small domestic filter-blower job this year, with the intent of adding refrigeration when the owner can afford it. Our experience indicates that this load is becoming a very desirable one. Again I quote a paragraph from "Barron's National Financial Weekly" of December 3, 1934, with reference to this home air conditioning: "However, it does not seem that the industry stands quite on the threshold of a home conditioning era. While the benefits of home-conditioning, which include minimization of attacks of colds and hay fever and the improvement of complexion and skin conditions, as well as the reduction of cleaning bills for curtains, etc., are undeniable, the American public so far does not know enough about them to regard air conditioning as essential. It seems more likely that the large-scale use of home conditioning will come into its own in three or four years, when the central-station and railroad fields have been well exploited."

ELECTRIC HEAT AT MASON CITY

The electric heating of the Coulee Dam contractors' camp, called Mason City, furnishes some interesting facts for our consideration here. In collab-

* This paper follows that by Mr. Bender.

oration with the contractors' architect, Juan Hargrove, we started work on this idea of electric heat from the day the bids were opened. There were dozens of other heating specialists also working on the problem and so we had lots of competition. Even our own officials at first doubted that such a load was even remotely possible. Together with J. R. Murphy of the General Electric Co., we presented to the contractors an estimate on the capital cost, operating cost and salvage value of such a plant after three years of operation. Of the three divisions we now have some actual figures for the capital costs, the others are yet to be secured. The figures indicate that the distribution and wiring costs were very close. We knew at the time that the equipment costs would be much lower than we have estimated but did not realize how much lower.

You will be interested to know that the central steam heating plant for the camp was estimated to cost $80,000 as compared to a net figure of around $50,000 for electric heat.

Comparing a furnace set-up, the estimate on a "C" type house was $300 for the furnace and chimney as compared to about $180 for electric heat per house.

As the camp was being constructed and the requirements began to exceed the capacity first set aside for electric heating, and the construction load also began to exceed the estimated transformer capacity, the contractors became worried about adding more heaters so they decided to put other heat into the hospital, store and recreation hall. In the hospital they installed oil heat with an air duct system. The cost of this was $6,550 compared to an estimated cost of electric heat of $2,500. With the latter they would not have secured humidification or air cleaning. The contractors estimated that humidification could have been added for about $300. After this experience in cost and the load factor realized even at 14 deg. below zero, there is no further anxiety over electric heat being diversified. In both the hospital and store there is considerable electric heat being used in addition to the heating plants installed.

The first two months' operation showed an average consumption on the "C" type houses of about 100 kw.-hr. per day for heating, cooking, lights, hot water, and refrigeration. The coldest day in the second month was 14 deg. below zero and the average consumption on the same type house for that day was 200 kw.-hr. Even with this weather the load factor for the camp was about 50 per cent. That is, there was a connected load of 10,306 kw. of which 7,700 was electric heaters. The maximum demand that day for the whole camp was 8,000 kw. but part of this was a maximum of 5,000 kw. indicated when conveyors were off for the camp only.

The Washington State College, with the consent of the contractors, is carrying on some experiments with different insulating materials and different methods of storing electric heat. They will use a representative group of houses and hope to secure data which will be of material assistance in designing future electric heating jobs.

The rate being charged the home renter by the contractor is three mills per kw.-hr. for all current but I understand there is a charge included in the rent to cover electrical fixed charges.

Conclusions

I am convinced that we have in this electric space heating load a potential market for a good many of these billion kilowatt-hours that are available out here in the west. I am also satisfied that the worries of our executives about the load factor, maximum demand, and the like are more theoretical than actual. Every new building is a prospect for electric heat and in some sections the utility salesmen are going after it. It may be a fact that a building owner will have to pay a premium for the cleanliness, convenience and automatic features of this heat, but in more cases than we realize, after considering capital investment, overhead, operation, maintenance and miscellaneous costs, the balance will be in favor of electric heat.

Air conditioning pertains to human comfort. I know of no single appeal more potent. Everything we do, every plan we make, every hope we have, finds its origin and consummation in our personal comfort. That is why air conditioning is a sound business and a lasting business. For the utilities each one of the six steps in air conditioning presents a potential market for the consumption of kw.-hr. Every home, every business, every industry is a potential prospect.

New times demand new ideas. In business the cry is, how can I get more business? sell more goods? make more profit? Every once in a while a new development comes over the business horizon that plays a leading part in the solution of these problems.

Air conditioning is that new development and already is giving account of itself. It is not a novelty, it is not a luxury, but it is a sound business reality, fulfilling a fundamental human requirement. It is paying profits to the dealer, merchant, manufacturer and utility. Can we sit by any longer?

Electric Heating As It Affects Air Conditioning*

By ARTHUR J. KERCHER
Consulting Electrical Engineer,
Berkeley, Calif.

ELECTRIC heating is destined to play a most important part in the future of air conditioning. A realization of this fact becomes more apparent when we consider the fundamental objectives of air conditioning.

What is air conditioning and what are we trying to do? We are trying to condition the air so that: 1. It will be as pure as practically possible. 2. It will provide the normal bodily comfort desired by human beings.

Air Originally Pure

The air which we breathe is pure enough to start with. The largest contributing factor to making air impure is the combustion of fuels. In such combustion we alter the composition of the air and then we proceed to make the air unfit for breathing by impregnating the atmosphere with the products of combustion, such as carbon dioxide, carbon monoxide, hydrogen sulphide, hydrochloric acid, sulphuric acid and water, commonly referred to as smoke, soot, cinders, excessive moisture, obnoxious fumes, and poisonous gases.

Combustion Increases Need for Air Conditioning

Practically all air conditioning systems developed to date are utilizing fuels which further contaminate the air, and therefore tend to defeat the purpose for which air conditioning was intended. It would therefore seem logical and sensible that the first step in air conditioning would be to eliminate these sources of air pollution.

The only system of heating which totally eliminates combustion and does not in any way alter the chemical composition of the air is electric heating. It is therefore self-evident that the ultimate in air conditioning will be the

* Presented as part of Air Conditioning Program of Commercial and Industrial Sales Bureau, Business Development Section, by Thomas J. Mellon, North Wesix Electric, Seattle.

total elimination of combustion and the general use of electricity as the heat source.

Electric Heating Not New

Electric heating is not new, as it has been a perfected art for at least 15 years. However, its progress has been retarded in some territories by extremists. On one side we have the enthusiast who has advocated the universal use of electric heat, and on the other side the ultra-conservative engineers who, alarmed by the words of the enthusiast, have branded electric heat as something impractical and economically unsound. Of course neither of these extremists is right. Years of electric heating experience have demonstrated this fact.

Electric Heat Now Making Real Progress

In spite of the extremists, electric heating is making progress, like everything else that is fundamentally sound. Needless prejudices are being overcome. Our present generation and those preceding it were trained to waste our natural resources rather than practice conservation. Our comforts have been acquired by wasteful cheapness rather than thoughtful and intelligent utilization of our natural resources.

Little thought has been given to the ultimate expense. Those who have appreciated the value of ultimate economy have come to appreciate that electric heating is not only a desirable possibility but an actual reality.

Electric Rates Over-Emphasized

The question of the cost of service rates for electrical energy is not entirely the deciding factor in the growth of electric heat. For years discriminating people who were appreciative of all the desirable features of electric heat have been continuously paying a premium for heat units by wire. Many through the knowledge of intelligent utilization are receiving a superior comfort service at a cost not exceeding some of the other means of heating.

The greatest number of satisfactory electric heating installations has not necessarily been in the territories having the lowest electric rates, but rather in the territories where intelligent engineering and the availability of perfected equipment has appealed to the discriminating consumer.

The individual who objects to paying a monthly bill after service is used can be counted out—at least temporarily. To the great mass of people only a limited use is possible; hence we must recognize that our market exists among a definite class of people who appreciate the better things in life—the type of man who likes a home a little better than his neighbor's, an automobile a little larger than that of the general run, and the man who possesses the desire and means to live rather than merely to exist. This is the type of consumer who comprises the market for electric heating and likewise air conditioning!

Utility Engineering Problems

Utility engineers have not generally analyzed the possibilities intelligently, as they are inclined to think only in terms of extremes. They are worried about peak demands that do not exist. They anticipate load factors that are purely theoretical. They count the cost of distribution by setting up a hypothetical situation that will probably never materialize, and they endeavor to substantiate their theories by reference to a few isolated cases, where misinformed and inexperienced individuals have attempted to subject electric heating to the limitations of other methods, by making the mistake of adapting electric heat to furnaces, steam radiators, or by introducing trick heating devices such as unit fan heaters, radiant glow heaters, and other fundamentally incorrect designs too numerous to mention.

Only an exceedingly small number of utility engineers have taken the trouble to acquaint themselves with the perfected developments of electric heating, and the development of systems which will alleviate any fear of an undesirable peak or a poor load factor.

Electric Heating Is a Simple Art

Although electric heating is extremely simple in application, the average engineer, for some reason, seems to be inclined to forget the fundamentals and endeavors to complicate the picture by extending his efforts at a tangent which leads to nowhere—unless it be confusion.

A striking example of this is the discussion of reverse cycle refrigeration process.

Reverse Cycle Process

The claims of efficiency in the reverse cycle process are true, and it will no doubt play its part in air conditioning in some territories. However, the climatic conditions are an important factor and its use is limited to relatively warm climates. It has the further objection that the apparatus has an excessive cost which makes it impractical at this time.

The utility engineer might also keep well in mind that when the day comes when the reverse cycle principle is developed to a state of practical economy, the user or consumer will have no further use for the electric utility. In many instances he can operate his own plant independent of the utility at a greater economy. My own experience in the design and use of combination Diesel compressor and generators with losses conserved by heating water indicates that fact. Thus reverse cycle has a negative load building value.

Perfected Electric Heating System

As electric heat is destined to play such an important part in air conditioning, it is well to note what perfected equipment is available for this purpose.

There is, first of all, the well developed unit space heater which can be built into the wall in each room with integral automatic control, thereby providing the most accurate means of temperature control throughout the house. These heaters operate by natural means, which eliminates the need for motors, fans, or other moving parts; therefore they have a long life and low depreciation. These heaters have balanced radiant-convection heating characteristics. In addition to circulating air about the room at a normal velocity, which provides a normal effective temperature, these heaters also have a cheerful, cozy, moderate glow which has a phychological effect that satisfies the inherent desire in all humans to associate color with warmth.

This is the only type heater that has ever acquired public acceptance, and is therefore the most popular system in use. Considering all phases, it is particularly adaptable for major heating, under climatic conditions that are moderate and where intermittent usage is required.

There is another type of heating system which has been perfected and which can be used in conjunction with the unit type heater and answers the utility engineer's problem of peak and load factor. This is the off-peak storage system. There is now available on the market an inexpensive, compact, flexible storage system, relatively small in size, providing accurate control of the heat, and which eliminates the undesirable characteristics of previous storage systems that had to depend upon cast-iron bricks and other heavy mass or unwieldy storage tanks as part of the equipment.

The storage system in itself will not solve the peak problem as a widespread use would tend to create a new peak. However, a combination of the unit and storage system will provide a highly desirable load factor and no peak problem. For example, the storage heater is controlled by a time switch so that it is consuming energy off the daytime peak. The heat is stored for a predetermined period at night, and during the day is released automatically by thermostatic control which is as accurate as that of any other central heating system. This system can be augmented in such places as the bathroom, breakfast room and kitchen with one or

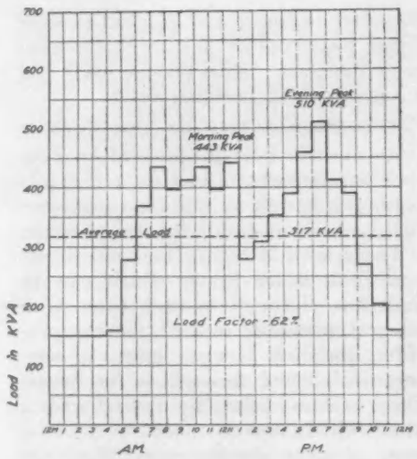


Fig. 1—Summer load curve for a typical rural feeder with relatively high percentage of electric heating

more unit heaters which may be readily moved about.

This combination offers the greatest flexibility, as energy is consumed for heating almost the entire 24 hours per day during the heating season. It also provides facilities for quick heat in individual rooms during the early fall or late spring season when complete house-heating is not needed. The use of thermostatic controls in the unit heaters further aids the diversification factor.

Application of Air Heating to Air Conditioning

With perfected electric heating systems of desirable characteristics to the utility and the consumer, the air conditioning problem becomes simple. In many territories, house insulation will serve to produce the desired cooling effect during the summer months. Adequate house insulation also has the advantage of effecting a further economy on the operation of the electric heating system. Where extreme summer temperatures exist, very often a relatively small capacity refrigerating unit is sufficient to cool the air in the house and likewise reduce the humidity.

In cold or very dry climates, humidity control in the winter also becomes a simple problem. Combustion systems operating at excessively high temperatures tend to greatly reduce the humidity in the house. With electric heat, the amount of moisture necessary can be easily supplied through small humidifying units, such as electrically operated water evaporators. These evaporators are made a part of certain electric heaters, fixed or portable. In fixed heaters, water is supplied to the unit continuously as needed. In portable or semi-fixed heaters, several gallons are placed in a container. In either case humidity is controlled automatically by an accurate humidistat. Continuous filters are also a part of some air heaters so that dust is continuously removed from the air.

Heaters in which a relatively high temperature is maintained to augment convection, have the effect of ionization on the air passing through the high temperature part of the heater. This ionization effect tends to eliminate the detrimental effects of those toxic hydrocarbon particles present in every room occupied by people. Weather-stripping will serve to keep dust out of the rooms, and air intakes can be provided with simple filters. In the winter, which is the rainy season, there is very little dust, and as the products of combustion are gradually eliminated, this no longer becomes an outside menace.

Proper air conditioning possible with electric heat, moisture control, and filtering not only make for comfort and health with less tendency to colds and infections, but it has a real *dollar* value. The life of your house furnishings and decorations is greatly prolonged, and it costs less to maintain them.

Available Information

Technical information with reports of operating costs for heating electrically are available to every one interested. Convenient handbooks on electric heating have been published by those who have had years of experience in the art. The Electric Heating Society, with headquarters in San Francisco, has much available data on this subject. The Electric Heating Handbook, published by the P.C.E.A., is also available through this Society. Manufacturers who have made almost a life study of the subject, and who have effected many thousands of successful installations, have engineering services and data available to all interested.

Conclusion

Major electric heating has been installed and in satisfactory operation in territories where two years ago the mere thought was ridiculed. Government projects, which have been greatly publicized, have served to stimulate renewed interest in electric heating. All-electric cities have been created almost over night.

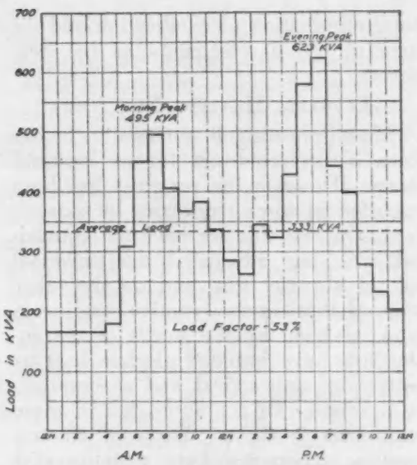


Fig. 2—Winter load curve for same rural feeder shown in Fig. 1

Recently a chimney-less all-electric apartment house was constructed in Tupelo, Miss. Electric heating systems are being installed in homes in California, the birthplace of modern electric heating, at a greater rate than ever before.

Auxiliary electric heaters of sizes suitable for bathrooms and of the type similar in characteristics to the major electric heaters, are being sold in greater numbers than heretofore. These serve to acquaint the public with the possibilities of electric heating on a larger scale, and form a beautiful foundation on which to build electric heating interest. The public has long been air-conditioning conscious. It is now becoming electric-heat conscious. The two go hand in hand.

Electric heating is fundamentally sound. Its use makes for conservation, and the ultimate in healthful comfort, and no one can retard its progress for long. In spite of all obstacles, electric heating will, in the immediate future, obtain the same public acceptance as the electric range and electric water heater; and eventually the same public acceptance as the electric light.

From a large number of charts showing the annual load factors in central California, we have selected two which are representative of the effect of a considerable electric heating load, taken July 27, 1934 and January 3, 1935.

The Value of Farm Electrification to the Company, to the Farmer and to the State*

By J. C. SCOTT
Puget Sound Power & Light Co.

WHILE the kilowatt-hour consumption on farms was not segregated on the books of the Puget Sound Power & Light Co. at that time, the annual use in 1925 was approximately 422 kw.-hr. per farm or less, excluding irrigation. In 1930, the annual current consumption per farm, excluding irrigation and spray, had risen to 1,127 kw.-hr. per farm. Since 1930, it has dropped to 876. However, we feel that the bottom has been reached, as it is beginning to go up again. The revenue for all farm customers for 1934 was $1,019,740, and at the end of the year we had 25,320 farms on our lines. Our average annual revenue per farm on 24,909 farms in 1934, was $40.94. Our farm electrification report for 1934 shows that our company has put on, and assisted dealers in putting on our lines, load building devices that will consume annually 2,384,490 kw.hr., which at 2.7c, our actual average farm rate for 1934, will amount to $64,381.25 in revenue.

The Portland General Electric Co. reports an average revenue per farm of $30.42 on 17,917 farms. The farm electrification department of that company reports added load with estimated annual revenue of $8,255 for 1934. The Northwestern Electric Co. reports revenue per farm customer for 1934 of $26.61 on 3,903 farms. The average annual revenue per farm customer of the Pacific Power & Light Co. was $58.32 on 8,711 farms. These revenue figures include irrigation.

The Idaho Power Co. and the Minidoka Project of the Federal Government are operating in identical territory, insofar as the nature of the farms and the opportunity of developing load is concerned. The Idaho Power Co. has done much to help farmers, carrying on a farm electrification program for a number of years. On the Minidoka Project, nothing has been done to help farmers except to generate and deliver electricity.

According to a report of the Agricultural Engineering Department of the University of Idaho, the current consumption of farms served by the Idaho Power Co. was 190.7 kw.-hr. per month, as compared with 49 kw.-hr. per month on the Minidoka Project. This report shows the farm customers' cost in the Idaho Power Co. system to be $.0194 per kw.-hr. in 1933, and the farm customers' cost in the Minidoka Project, not including any allowance for the $50 to $200 investment in lines and maintenance charges, to be $.0243 per kw.-hr.

Outlook for the Farmer

The farmers' economic condition has been comparatively low for a long time, but indications are that the cycle is rapidly changing. From the U. S. Department of Agriculture we learn that $1 worth of farm products in 1914 would buy 100 cents worth of merchandise. In 1921 he could buy only 82 cents worth. This figure fluctuated downward, until in February, 1933, he could buy only 54 cents worth of goods with his dollar's worth of farm products. Since that time the value of the farmer's dollar has been continually rising, until in November, 1934, his dollar was worth 80 cents in the purchase of those materials which he has to buy. The point I want to make is that the economic condition of the farmer has been below that of industry and commerce for the past fourteen years. In accordance with economic law, which runs in cycles, the farmer is due for several years of prosperity.

Value to the Company

The farm load is a desirable load from the standpoint of the company's business. It is not affected by depressions to the same extent that other loads are. We build up considerable industrial load in industrial communities. Depressions often cause, if not a complete shutdown, a considerable curtailment of operations. This not only affects the load we are selling to the industry but also affects the residence business in that community.

While farmers curtail to some extent the use of electricity in extreme depressions, yet in minor depressions they show little or no curtailment, and in extreme depressions they do not show the same curtailment as do industries. The large majority of farmers run their business in connection with their homes. They must continue their business. They do not pull up stakes and move out as easily as workers engaged in industry. It is our business to help the farmer in such a way that he will want to buy more electric service.

Value to the Farmer

I want to bring to your attention just a few of the ways in which the various companies of the Northwest are assisting farmers.

Hop Drying—The California-Oregon Power Co. reports that hop men have been able to dry their hops two to four times faster than by old methods, by the installation of fans, powered by 3 to 5-hp. electric motors. This new process, devised by the farm electrification engineers, has made the drying operations independent of weather conditions, and has also improved the quality of the dried hops. This means real money to the farmer. Eighty-five per cent of the dryers on the lines of this company are now electrified, and in another year or two, every dryer will be equipped with electric fans. The power company benefited by the increased revenue of from $20 to $35 per season, although the farmers benefited by several hundred dollars. Similar improvements have been made in prune drying.

Irrigation—In western Oregon, where irrigation is not supposed to be needed, many farmers are getting from irrigation an increase of at least four times the production on beans, beets, carrots, tomatoes, and many other vegetable crops. This is in the region where the annual average rainfall exceeds 30 in. Irrigation on walnuts raises the quality of the nut, placing over 75 per cent of the nuts on the top grade. Irrigation of berries in western Oregon increases the production two to three times, and makes a marked improvement in the product. Irrigating pasture crops supplies green pasture feed for six or seven months, where dairymen formerly got only about three months of full feed on pasture, and the rest of the year pasture feed had to be supplemented by hay and grain.

†C. J. Hurd, Mountain States Power Co., Chairman; R. S. Overstreet, Idaho Power Co., Vice-chairman.

* A report of the Rural Sales Bureau, Business Development Section.

One dairyman in western Washington reports his electrically-driven irrigation outfit saved him a $1,500 feed bill the first year it was installed. The first cost of this outfit was only $1,000, and his power bill ran from $75 to $100 per year. In addition to saving on feed bills he got more milk and butterfat of high quality than he did in former years. Other farmers in western Oregon and Washington report that irrigating pasture is worth an additional net profit of at least $10 per cow per year.

Refrigeration—In western Oregon, over 50 per cent of the creameries are now paying a premium of from 2 to 5c per pound of butter fat for refrigerated cream. A cream farm having 25 cows can make an additional net profit annually of $200 to $250 from this premium. Dairy refrigeration, together with electric water heating and sterilizing equipment, makes it possible for dairymen to sell Grade A raw milk. This places them in a position to be a producer-distributor, which in turn, gives them an opportunity to get a still higher premium on their milk.

One farmer in our territory has installed a refrigerator plant for farm egg cold storage. In this he stores all his eggs while prices are low, and then sells his entire year's production only when prices are at peak.

Hotbeds—The electric hotbed and propagating bench enables greenhouse operators to propagate all cuttings in one half to one third the time it took under old methods. It has also enabled them to increase the number of cuttings to take root, from 45 and 50 per cent of the Cascades, is particularly adapted to the production of high quality blueberries. This industry has not grown as it should, because of the extreme difficulty in propagating the plants. Our company has worked with a blueberry farmer by helping him to propagate using electric heat, with the result that the cost of his blueberry plants will be reduced from an average price of $1 down to 15c or 20c.

Soil Sterilization—One of the most difficult problems with which the greenhouse operator and florist has had to contend is the fungus diseases, insect pests and weed seeds which are present more or less in all soils. Our farm electrification engineers have devised a practical and economical electric method of completely ridding the soil of these pests. One operator has had in the past to discard as many as 1,500 Azalea cuttings in one year on account of insects alone, and frequently has had his crop reduced to nearly nothing by fungus diseases. He claims that last year, after using the soil sterilizer, out of 18,000 plants not one had to be taken out because of injury from insects or disease. No more conspicuous example of the value of the work of our farm electrification engineers in devising new methods of value to farmers has ever been demonstrated than this practice of sterilizing soil for greenhouse men and florists.

Poultry Brooders—A few years ago the experiment stations expected poultrymen to have a mortality of at least 20 per cent of the baby chicks they put into the brooder—before the brooding season was over. For years our farm electrification engineers have been improving electric brooders and brooding methods, until during the past year, those poultrymen who use the modern means of electric brooding reported mortality of from absolutely nothing, to 7 per cent. The cost of brooding has been reduced by half, and the quality of chicks developed has been materially improved. This is indicated by the fact that under old methods poultrymen used the brooders from six to eight weeks. Last year one poultryman, who used the newly developed forced air draft electric brooder, brooding 36,942 chicks, was able to take most of them away from the heat at three weeks of age, and none of his chicks used the heat more than four weeks. Not only did these chicks develop into better pullets, but this method also eliminated cannibalism, a serious problem among poultrymen.

Lights—A county agricultural agent said recently that no poultryman expects to make any money at all without using electric lights on the layers. Therefore, we might conservatively claim that without the electric service farmers are getting in the Northwest, we would have no commercial poultry industry here. The use of electric lights on a flock of 100 hens during the fall and winter is responsible for doubling egg producing during the high priced season.

DAIRY WATER HEATERS AND STERILIZERS

—A few years ago a dairyman asked if we could devise some kind of electric water heater and sterilizer that would clean his utensils so that he could cut down the bacteria content in his milk. We assisted this dairyman in solving his problem. He has been selling milk ever since at a premium over his old price. That was the beginning of our work in developing and introducing electric dairy water heaters and sterilizers to dairy farms. Hundreds of our dairy farmers are now using this equipment, not only helping them to produce a better article for which they get a premium but also eliminating a tremendous amount of labor.

Another way in which electricity is helping dairymen is in providing running water for water troughs and for cleaning out barns and milk houses. The labor saved for this installation amounts to several hundred dollars per year on an ordinary farm.

Electric lights cut down the time for doing chores, by 30 per cent in comparison to old lantern methods. Many dairymen, and poultrymen too, have been annoyed by a drop off in production due to cold drinking water. We have helped eliminate this difficulty with an electric water warmer, making it possible for them to keep up production to the maximum during extreme cold weather.

We have many times helped farm equipment dealers iron out troubles that were a problem to both the dealer and the farmer. Some farmers in the Yakima Valley were having trouble with their electric power spray plants. The spray plant manufacturer laid the difficulty on the source of power, but a check of the voltage and other power conditions showed the electric service to be in first class condition. This left the fruit grower with a piece of equipment not operating satisfactorily, and unable to secure any assistance from either agency concerned with its service. The farm electrification engineers came onto the job and found that in certain cases the trouble was in worn valves on the spray pump, wrong pulleys to drive the spray pump, worn discs in the spray nozzles allowing the discharge of too much spray, or an accumulation of sediment in the pipe lines, resulting in overloaded motors.

There are many other ways in which we have been able to help the farmer reduce his cost of production or cut down his time and labor in doing farm work by the application of electric motors to do many farm jobs, all the way from cleaning eggs and burning out stumps, to cutting hay and filling the silo. We feel that by helping farmers in our territory to be more prosperous, we are laying the best foundation on which to work for the prosperity and well being of the entire community, including its industrial and commercial development. There can be no prosperity in rural towns and cities unless the farmers are prosperous.

VALUE TO THE STATE

There are many thousands of acres of fertile lands in our territories unsettled. We believe that the best way to attract people to develop and live on these lands is by helping to make the farmers who are already here more prosperous. While ballyhoo and high pressure salesmanship and advertising may help develop and settle a country, yet a more solid foundation for future

growth and development of the country and the contentment of its people is built on the prosperity of the people now living in our communities.

In this connection we make an effort to get the homely information from the ordinary successful farmer right here in our territory and then tell it to his neighbors in such a way that they can take hold of these better methods and use them to their own advantage. We also constantly study the reports of state experiment stations, of the experiment stations of the U. S. Department of Agriculture and the development work of other power companies and industrial organizations, in an effort to pick out the particular information that will be of value and help to the farmer and his family in our territory, regardless of whether or not it concerns electricity. It is our business to help the farmer with improved practices and methods that he can use to his own advantage on the farm. After years of experience, we find four distinct divisions in our farm electrification job.

1. We first analyze the real problem of the farmer in connection with the many details on different types of farming in our territory. To do this requires personal contact with the farmers themselves. Contact with other agencies interested in agricultural development helps, but will not take the place of personal, informal talks with the farmer on his own ground.

2. Next we seek a solution to this problem. We may know the solution from past experience. We may find it has been worked out by some experiment station or other commercial organization. If it has not been worked out, it is our job to try to work it out, and in these activities we often call for the help of the experiment stations or other organizations.

3. When the apparatus has proven successful and demonstrated to be of economic value to the farmer, our third step is to get it manufactured and distributed.

4. Our last job is educating other farmers concerning the benefits of this new idea. Methods of educational work include personal contact with the farmers, demonstrations in each community, talks, stories, radio talks, and booklets. Some of the companies issue monthly bulletins.

While the value of our farm electrification work seems to be directed entirely to the benefit of the farmer, the results extend to the development of nearly all industries, transportation, and commerce in the state, and a very great degree, beyond the state.

Poultry—An average poultry farm in western Washington takes in about $5,000 per year on its poultry operations alone. This means that the development of our logged-off lands, even into small poultry farms, puts into circulation nearly $5,000 new money in our territory for every such farm started. I say new money, because eggs are on an export basis in the Northwest. Farm electrification has played an important part in the development of this poultry industry, because if it were not for the opportunity of poultrymen to use electric lights, there would be no commercial industry here.

In 1917, it was necessary to ship 160 carloads of eggs into western Washington alone to supply local demands over and above what was produced here. In 1933, besides taking care of local consumption, 1,638 carloads of Washington eggs were shipped out of this state to markets in 18 other states, and with the domestic market constantly growing. In addition, Washington eggs are carried in refrigerator boats to Alaska, the Hawaiian and Philippine Islands.

Since 1919 the number of cases of eggs produced in Washington has increased from 592,238 to 2,269,000. Poultry production grew from practically nothing, except a little side line in 1917, to a $30,000,000 industry in Washington alone, in 1929. From 1919 to 1929, egg production was doubled in the state of Oregon.

The quality of eggs produced under Northwest conditions is much better than the quality of those produced as a side line on farms in other parts of the United States, and electric service helps in many ways to accomplish this. In 1923 there was a premium of 1.1 cents per dozen paid on Northwest eggs as against eggs produced in districts adjacent to the New York markets. It was 3.0 cents per dozen in 1929, and in 1933 it was 2.85 cents per dozen, as compared with the price paid for nearby New York whites, and as high as 8.5 cents per dozen compared with the best grades shipped in from the Middle West.

We can begin to realize the importance of electric service to farms in developing new industries and bringing money into the state, when we realize, as has been shown, that no commercial poultryman tries to produce eggs at a profit without lighting the hens. The difference between success and failure in the poultry business in this section is electric service.

Dairying—High quality has made it possible for Northwest dairy products to command a substantial premium in many of the eastern markets. The dairymen in Skagit and Whatcom counties in Washington have been particularly active in recent years in the installation of electric equipment in their dairies. The Cooperative Dairy Associations of Skagit and Whatcom Counties are able to get a premium of 2 cents per pound for their sweet cream butter. Much of this sweet cream butter is exported to eastern markets, where it comes into competition with the very best cream produced in other parts of the United States. This means new money into the state, not as a result of increased production, but as a result of improved quality of production, in which electrification has played an important part.

Irrigation—The value of initiating the practice of irrigation is clearly indicated in that it doubles and trebles production on each acre of land irrigated, and this results in bringing into the state more money by thousands of dollars. It results in higher profits to the farmer without his having to bring into production new lands.

New Lands—The agricultural engineers are doing some important work in connection with developing new lands. As has been brought out, a poultry farm of average operations brings into the state an average of some $5,000 per year. We have room for many more farmers, not only poultry farmers, but berry farmers, vegetable farmers, and dairy farmers.

One of the greatest drawbacks in the establishment of new farms has been the fact that it costs about $150 to $500 per acre to clear the stumps and get the land in readiness for cultivation. Now that cost has been reduced to a range of from $40 to $75 per acre by burning, using an electrically-driven blower. Tractors and stump pulling machinery have always represented a large investment. The investment represented for equipment under this new method is only about $60. Incredible as it may seem, good sized stumps have been removed for as little as 5 cents, that is, the cash cost to the farmer excluding labor, which amounts to very little. At Roy, Wash., in October, 1930, 264 stumps were removed from two and one-half acres at a cash cost for electricity of less than $5.00; under the old method the cash cost, including labor, would have been $200 or $300.

In Pierce County two or three years ago, in a land clearing contest, the winner cleared his acre of land for $58, including labor. His cash outlay for the job was $4.74, and the depreciation of machinery was figured at $2.50. This illustrates that a settler with a small amount of money can go onto a piece of land, start poultry or dairy operations and, with labor such a negligible part of the clearing job, can continue to clear his land while doing the chores in connection with his poultry or dairy business. Further he needs a cash out-

lay of only $40 to $75 per acre for clearing, as compared with $75 to $150 for powder by the old method, to say nothing of the greater investment for the machinery and a tremendous amount of labor.

There are 9,000,000 acres of logged-off land in Washington, 3,000,000 of which are classified as suitable for farm lands. Let us be conservative and say there are 1,000,000 acres suitable for clearing and farming. This forced air draft method of land clearing then, with a minimum saving of $160 per acre, would save a total of $160,000,000. This, we might say, represents the conservative value to the future homemaker in the state of Washington of this one electrical development.

In the establishment of these new lands into farms, we have the foundation of the prosperity and well being of the entire Northwest. Some years ago the town of Winlock, Wash., was a logging town. When logging operations gave out, the business men of the town got their heads together to develop some industry that would take the place of the lumber. They sent out and got some baby chicks and induced a few lumber jacks, who had established homes on little pieces of land, to start the production of poultry. This industry developed, until now there is an income into the Winlock territory in ordinary times, of over $1,000,000 a year for poultry products alone. The result has been that Winlock is a much more stable business center now than it ever hoped to be under the old regime of lumbering.

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Comments on Farm Electrification*

By R. S. OVERSTREET
Idaho Power Co.

WE have heard many remarks at this meeting concerning the different new business and load building programs to be inaugurated for the year 1935, and also the fact that many of these programs must be sold to the managements of the various companies. We of the Idaho Power Co. seem to have considerable difficulty in keeping up with the new business and load building ideas of our own management which always seems to be far ahead of us with plans for new business.

*A report of Rural Sales Bureau, Business Development Section.

With reference to the Rural Sales Bureau it would seem necessary that we undertake a program of making electric service available to all possible rural customers. The electric cooking saturation of rural customers served by the Idaho Power Co. is high, due in part to the comparatively high price of competitive fuels. While this is probably not the case on the coast where other fuels are low in price, it would seem quite possible that considerable load could be built through increased saturation of radios and particularly through better lighting of farm homes in connection with the National Better Light-Better Sight program.

There has been considerable talk to the effect that by 1945, 45 per cent of all rural customers in the United States should have electric service; that the average rate per kw.-hr. should be 3½c; and that farm customers should receive the same rate as city customers. In the territory served by the Idaho Power Co. at present, not in 1945, this company serves approximately 60 per cent of all rural customers at an average rate per kw.-hr. for domestic customers of 3.53c, and all farm customers receive the same rate as city customers.

Residential Sales Bureau† + + +

1935 Sales Plans of Puget Sound Power & Light Co.*

By F. E. ROSS

AS a background for the development of its 1935 sales plans, our company decided to secure actual figures covering market possibilities, appliance saturations and various other factors that in the past were either assumed or estimated. We felt that this was necessary during 1935 in order to intelligently draft a plan that would produce the most in the way of revenue. We found by actually counting the appliances that the saturations were very disappointing. We found a range saturation of only 20 per cent, instead of the estimated 35 per cent, a saturation of refrigerators of only 10 per cent and of water heaters of only 7.3 per cent. There were 28,898 ranges in use, 14,000 refrigerators and 10,000 water heaters. Of these 10,000 water heaters only 1,000 are off-peak; the rest are manually controlled (metered) or on flat rate.

We are on a second program of investigation concerning our major appliances. This is finding out what the annual consumption is for range, refrigerator and water heater on our lines. This investigation is not yet completed but indications are that, as far as our territory is concerned, the estimated annual revenue from appliances has been set too high. In this connection may I point out that I do not believe operating conditions are much different in the other companies in the Northwest; that if you delved into their figures you would find the actuals to be considerably lower than the estimates.

We went even further than this in our market. We found that our customers classed themselves naturally into three buying groups. Of our 140,000 domestic customers 8,600 were in the "A" group; 81,800 were in the "B" group and 49,490 were in the "C" group. These groups represent a definite stratum in buying power. We have found that Class "A" has a range saturation of 47 per cent, Class "B", a range saturation of 25 per cent, and Class "C," 7 per cent. The other appliances will run about the same proportion.

We arrived at the conclusion that it would not be worth our while to spend our efforts on the remainder of the group "A" customers as this remainder only represents 4,500 customers. We did feel, however, that the 107,430 customers in Class "B" and Class "C" represented the field for our greatest return in annual revenue through the sale of a water heater and range.

We determined that it would be necessary to have a low down payment and low monthly payment for an electric range and electric water heater to make it possible for this group of 107,000 customers to buy this equipment. We also felt that a down payment and

†Glenn L. Jackson, The California Oregon Power Co., Chairman.

*A report of Residential Sales Bureau, Business Development Section.

terms should be in the neighborhood of $2 per month. We started with this as the premise upon which we were to buy our equipment. After negotiating with all the principal jobbing representatives, who cooperated with us to the utmost in the matter of bidding, and on the recommendation of their best equipment we decided upon a specially built Hotpoint range with 3 Calrod surface units, a 16-in. oven, automatic timer outlet, indicating thermometer and white enamel finish. The model is the conventional console design. The question immediately rises—why the console when the table top is in vogue? We felt that the table top, although in vogue, had not proved itself as a conventional model. The console on the other hand has already been on the market for a number of years. We did not want to sell a period type of equipment.

We finally selected a water heater built to our specifications by Hotpoint which is somewhat different than the standards set up by them. We had this water heater equipped with a Monel metal tank. This tank is guaranteed for twenty years.

The Sales Plan

We established $90 as the cash price for the electric range and $128 installed as the cash price for the electric water heater. Our plan includes term payments of $1.95 down and $1.95 a month, with 60 months in which to pay, for the range without wiring; $2.25 down and $2.25 a month, with 72 months in which to pay, for the range with wiring, and $2.35 down and $2.35 a month, with 72 months in which to pay, for the water heater, and we service this equipment for the term of the contract.

We set, as our yearly quota for ranges 5,500, our quota for water heaters 5,200, and for refrigerators 700. Our first month's work indicates that we are well on the way to accomplishing this bogie.

In order to move this amount of merchandise we divided our territory into districts of approximately 1,400 customers for each salesman. We have enlarged our merchandise sales organization from 30 men to 100 men; we set an individual quota of 52 water heaters and 55 ranges for each man.

This program was first announced with an institutional advertisement, prepared and signed by Frank McLaughlin, President of the company, entitled "Still Blazing New Trails—toward the more abundant life that comes with the fully electrified home." This advertisement appeared in all daily and weekly papers and was followed on January 21 by our first merchandise ad. In addition to a complete newspaper advertising program we are using circus banners for the stores, colorful cards, billboards and radio programs.

Typical billboard

We are using every useful medium in our territory and we are selecting it not from any policy angle but rather on the basis of productivity. We have enlarged the size of our advertisements. We are supplementing our deluxe billboards with 24-sheet posters in all districts. We have enlarged our store banners, store displays and have added truck banners and tire covers.

The first six weeks' program which started January 21 and ended March 2 was set aside for a training period for new salesmen and to get the story over to our employees. To reach our employees in itself has been a considerable task. We printed several thousand employee newspapers that told the story about our program and also an employee booklet on how to make a sale and how to find a prospect. We have supplemented this printed matter with meetings in the districts. We have built these sales meetings into shows.

Introductory advertisement

Still blazing NEW TRAILS!

—toward the MORE ABUNDANT *Life that comes with the* FULLY ELECTRIFIED *Home*

THE only sound basis on which a business can justify its existence and endure, is to make this world of ours a better place in which to live. Worthwhile enterprises have wholesome objectives in the public interest and earnestly desire to contribute their share to the advancement of the welfare of mankind.

The ideal toward which this company is constantly striving is to bring to the people greater benefits through an ever increasing use of electricity at constantly decreasing rates. We who visioned the possibilities of electricity when it was a puny infant still have the mother's hopes and expectations of our son. We still think of him as the home town boy who has and will continue to make good.

* * *

OUR RATES ARE LOW—I know of no comparable area served where the rates are so attractive. Further, they are so designed that the more a customer uses the less the unit cost. *But no matter how low the cost of electricity or how plentiful the supply, its usefulness and benefits are necessarily limited by the purchasing power of the consumer.*

Many homes await greater conveniences, comfort, cleanliness, healthfulness in electricity's larger use could they but buy appliances on an exceptionally low, easy payment plan. This is what we now propose to give our customers—*the wonderful opportunity to buy an electric range and electric water heater at amazingly low terms*—heralding another great forward step along the pathway which leads to the fully electrified home. *Watch for* this announcement—it will appear in this newspaper shortly.

* * *

WE FEEL that in this progressive move to benefit our customers by still further expanding the use of electricity, cutting down the cost of its application in the home and on the farm, we are helping industry, helping to solve the economic problems of the day—helping to give employment to more men and women—helping to build a Greater Washington.

It is our wish that 1935 will see thousands more homes in Western and Central Washington made happier, healthier, cleaner, more inviting by the increased use of this marvelous electrical servant that costs so little and accomplishes so much in the banishment of drudgery, saving of money and the greater joy of living.

Frank McLaughlin
PRESIDENT

PUGET SOUND POWER & LIGHT COMPANY
Better Electric Service

A very important part in our program is our dealer cooperation plan. We have made it possible for every electrical dealer, contractor and plumber in our territory to sell the special range and special water heater on our conditional sale agreements—credit to be approved by our credit department. The dealers receive an attractive bonus of $10 per range and $15 per water heater. The dealer need not purchase this equipment—he merely acts as our selling agent.

The special equipment we are offering on long terms should not be confused with our regular line of appliances sold on our regular terms.

In order to make our own sales organization more effective we changed the compensation of the salesmen from a salary to a salary plus bonus. We are giving all the new men coming into the organization a trial period, during which time they are on a bonus only. During the first six weeks of our program, employees receive a bonus for sales made on their own time, and they also receive $1 for tips that result in the sale of a water heater or range. Beginning in March we have changed the employee bonus plan by enlarging the bonus on tips and eliminating the bonus on sales.

Our advertising for this program is two-fold. We felt that the plan itself did nothing to sell the fact that credit is due to the Puget Sound Power & Light Co. for these terms. We have, therefore, built an institutional program to run with our merchandise. Mr. McLaughlin is signing the institutional ads himself. These ads are based on the theme "The fully electrified home—the more abundant life to be derived from the use of electricity." This story is written very much to the man on the street.

It is needless to say that our organization is enthusiastic about the possibilities of our 1935 sales plan. They see in it a definite change of policy from the *defensive* onto the *offensive*. We can say that we have forgotten our troubles and are selling our way out.

I have primarily covered the merchandise plan; other sections of our 1935 program I believe are just as attractive. We recently organized a commercial lighting department of 9 men, and a home lighting department of 12 girls. We have also re-organized and enlarged our home service department. These departments are already well under way on their own programs. We are capitalizing more than ever on our home service department, and they are on a home service campaign basis the same as merchandise men are on a sales campaign basis. The same is true of our lighting department.

Selling Bureaus Promote Appliance Sales*

By L. W. BRAINARD
Idaho Power Co.

THE subject of refrigerator sales is closely related to that of dealer coordination and sales programs. Sales activities should be set up and outlined with major consideration given to the effect they will have on dealer sales activities. I am sure it is universally agreed that the utility's major interest is that of load building and that the largest total number of refrigerators be sold rather than by what type of outlet they are sold. We can all well study the phenomenal development of the refrigeration market. What utility sales manager has not looked at the records and studied them with a view to securing the same dealer support and consequent total volume for other major load building appliances.

Reports from member companies from which I was able to secure data for this report show that during 1934 the percentage of total refrigerator sales by utility company sales organizations in the territory varied from a minimum of very few units to a maximum of 27 per cent, leaving the dealers' portion of the total sales to vary from a low of 73 per cent to a high of practically 100 per cent.

Data available as to the increase of the dealers' percent of the total sales by years, over the past several years, show that since 1928 the dealers' percentage of the total has increased from a low of 10 per cent up to the percentages quoted above.

An estimate of the increase in the volume of refrigerators to be sold by all outlets during 1935 varies from a low of 10 per cent to a high of 30 per cent; and a forecast of the percentage of sales to be made by dealer outlets during 1935 varies from a low of 32 per cent to a maximum of 100 per cent, the latter being in territories where the utility does not merchandise electric refrigerators.

From the above data and estimates secured through utility sales managers and a check of the reports issued by the Edison Electric Institute showing refrigerator sales for the year 1934 and percent of quota reached by territories, it is apparent that the greatest percent of quota, as assigned by the Institute, has been reached in those territories where the proper balance was maintained between the portion of the total sold by the dealers and that sold by the utility.

A study of the refrigeration market, the sales situation in the territory served by my own company and the comments of other Northwest utilities, have revealed the following questions as being of outstanding interest to member company sales managers:

1. By what type of sales plan can I secure the greatest load building results?

2. Should the utility merchandise electric refrigerators or leave this entirely to the dealers?

3. Providing utility does merchandise refrigerators, should more than one make be handled?

4. What percentage of the total retail refrigerator sales in the territory should be by the utility and what percent by the dealers ?

Sales plans authorized by my company for 1935, which vary but little from the general plan followed during past years, give the following consideration for the points outlined above; and with but few exceptions, these have been acceptable to manufacturers, jobbers and retail dealers.

1. It is felt that the greatest total load building result is to be accomplished through a properly coordinated dealer and utility sales plan; that utility sales activity, properly coordinated, will help the dealers to make sales and the dealers' efforts will help the utility with the result that business will be stimulated for both and the net result a higher total development than would otherwise be possible.

2. The question of the possibility of the utility leaving the merchandising of electric refrigerators entirely to the dealers came from two sources. Information submitted by some of the Northwest companies show that they have not sold refrigerators, some discontinued during 1934 and one company indicating that it was discontinuing the sale of these during 1935, at least in some locations. Some manufacturers of other major appliances, principally ranges and water heaters, have urged that refrigerators be given over entirely to the dealers with the agreement that dealers leave the merchandising of ranges and water heaters entirely to the utilities. The sales plans of my company, although the company does not merchandise radios, clocks and some other domestic appliances, have been set up on the premise that the total merchandising results to be accomplished in the territory will be the greatest if the company remains active in the market, with the intensity of its own activity regulated according to the activity and results secured by the dealers, and through encouraging the maximum number of high class and legitimate dealer merchandising outlets.

3. The question of the utility handling more than one make of refrigerator has been given consideration because of the manufacturers urging the utility to handle additional makes. This policy has been promoted principally where there is a lack of sufficient satisfactory retail dealers such as in less densely settled territory, and is very probably not a factor in the larger centers of population. It is quite natural that all manufacturers would rather have the utility account—or even divide it with some other manufacturer—than to rely on dealer outlets for their volume, and they cannot be criticized for their effort to secure additional business. Good business reasons, however, involving investment in stock on hand, satisfactory turn-over and justice to dealers in the territory, dictate that a utility should not merchandise more than one make of refrigerator. If the total load building results are dependent on the number of satisfactory dealers and their sales activities, it should then be to the interest of the utility that manufacturers be urged and encouraged to develop additional dealer outlets, and the manufacturer's interest in dealers is zero after the utility account or even a portion of the utility's volume is secured.

4. The fourth question "What percentage of total retail refrigerator sales should be by retail dealer outlets and what percentage by the utility," has been pretty well answered by the data supplied by member companies and quoted above. The answer to this question depends on the class of dealers handling refrigerators and the load building results being secured through this channel. In my own company territory, with approximately 20 per cent saturation and with aggressive sales plans to be carried on by dealers during 1935, it is anticipated that our own company stores should do not more than 20 to 25 per cent of the total business, and that this percentage should

* A report of the Residential Sales Bureau, Business Development Section.

very probably decrease from year to year providing the total sales of refrigerators hold up and show an increase from year to year.

Results will be regulated by the number of sales campaigns featuring refrigerators, special commissions offered to salesmen and the amount of advertising devoted to the particular make of refrigerator handled. A survey of 1934 sales activity indicates that, by a little greater concentration of effort, the company's refrigerator sales for that year could have been increased from 50 to 100 per cent. This was regulated during 1934 and will be during 1935 in view of the activities carried on by dealers and their ability to develop the refrigeration market at a reasonably rapid rate.

It is part of my company's 1935 sales plan to increase sales effort on refrigerators in rural territory. It is apparent that sales effort on domestic refrigerators, particularly those of the larger sizes adequate for milk cooling and supplying storage for home butchered meat, has been lacking in rural territories. It is expensive and unprofitable for the dealer to develop the rural market; whereas the utility salesman can develop the rural market while in rural territory on other business, so that refrigeration selling need not bear all the expense of rural transportation.

Electric refrigeration is a service due rural customers since the need and profitable use of electric refrigeration is as great, if not greater, on the farm than in urban centers.

Another dealer activity to be encouraged is that of refrigerator service shops. There are already in the possession of customers refrigerators sold in the past few years which have since become orphans, and there very probably will be more in the future. Without regard to the make or quality of such refrigerators, it is a well known fact that all customers look to the utility for repair service if this cannot be secured elsewhere. If service shops are not available for the repair of such machines when it is needed, the utility will be in the position of supplying this service whether it wishes to or not.

For this reason, service shops in position to service all makes of refrigerators should be encouraged and such service calls coming to the utility for makes of refrigerators other than the one handled by the utility should be turned over to these shops, thus increasing their revenue and making it profitable for them to continue so that they will be in business and ready to supply a service when needed.

Appliance Selling Bureaus

Since the origin of the National Refrigeration Bureau, my company has participated in local refrigerator bureaus tieing in with the national activity. These were later expanded to include activities of the National Cookery Council. While the results from these local organizations were quite satisfactory, it seemed somewhat difficult and a duplication of effort to promote separate cooperative organizations in connection with the National Running Water program, National Table Cookery Program and also with the National Better Light-Better Sight activity. It was also felt that the company had an obligation to support radio retail dealers, although it does not merchandise this device.

With the necessity of cooperative organizations in connection with all of these national programs, it was decided to develop a single organization which might include them all, as well as other cooperative activities that might seem justified by local conditions.

As a result of this decision the Electrical Equipment Sales Association was organized throughout the company's territory, this being divided into six districts, each of which is headed up by a district chairman. Each district organization is divided into five bureaus as follows: Range and Refrigeration Bureau (these two items being combined); Table Cookery Bureau; Running Water Bureau; Better Light-Better Sight Bureau; and Radio Bureau.

Each bureau is sponsored by a chairman and these five bureau chairmen, together with the general district chairman, act as an executive committee. This supplies in the territory six executive committees of six individuals each, all of whom are dealers or representatives of dealers.

The advantage of this type of organization is that it is much easier to secure a meeting of six individuals and reach an agreement and transact business with this small group than with a larger general meeting of all dealers. Since these executive committees have been authorized and are in position to pass on cooperative plans and are available to promote cooperative activity, general meetings involving all dealers are called only three or four times during the year; and these, when called, are devoted to educational programs covering the company's rates, activity to eliminate radio interference and other similar subjects.

The company's principal contribution to hold the interest of these organizations is the release of promotional and educational advertising over the name of the association. Prior to the organization of the Electrical Equipment Sales Association—or, as it is commonly termed, the E.E.S.A.—promotional and educational advertising was released over the name of the company. The ads were carefully written and the copy carried the statement, "See Your Dealer." These were felt to be of little value, however, to either the dealers or the company. Because they did not carry the dealers' names they did not bring prospects to the dealers' stores. Neither did they bring prospects to the company's store, as the public is inclined to discount educational advertising when released over the name of any one institution.

These ads, when released over the name of the association, are not only of much greater value to the dealers but to the company as well. Notice of promotional ads to be released are sent out to all dealers some ten days to two weeks in advance of publication dates which gives the dealers sufficient time to prepare their own ad, which is a product ad, for release on the same date and in adjacent space. By this means the dealer gets full benefit of the promotional ads and the dealer tie-ups with these promotional ads as well.

Comment seems to indicate that they are not only pleased with this support from the utility but that they are getting results from it.

The total of all such ads released during 1934 shows the total tie-up advertising space taken by dealers was in excess of the space taken in promotional ads. Thus the dealers have more than matched dollar for dollar the company's advertising appropriation for this type of advertising.

Development of Residential Lighting Load*

By J. B. BUMAN
Northwestern Electric Co.

A CAREFUL study of general home lighting conditions found everywhere, coupled with the alarming statistics brought out by the eye specialists and the medical profession, immediately indicates that we have a humanitarian service to perform with a sound commercial aspect. Obviously when we have 10,000 foot-candles outside on a mid-summer day and not less than 1,000 foot-candles on a cloudy day, with our customers using from 2 to 4 in their homes for ordinary visual tasks, we have a definite job before us to sell better lighting which is sure to be appreciated.

Seldom does an industry have the opportunity to enjoy such strong support and recognized authority as the optometrist, the oculist, the ophthalmalogist, and other medical men who are cooperating most willingly in such a program as improving lighting standards for eye conservation. There are also trade guilds and manufacturers who are putting their shoulders to the wheel in this great cause, and these point substantially to the fundamental principles of our Better Light-Better Sight program.

Although lighting service has been the mainstay of our business all these years, from the general evidence before us we must admit that until now the job we have done in selling lighting service for the home, and even in the commercial and industrial field, has been a poor one indeed. In the home particularly, the customer has used only enough light for bare necessity, or perhaps for subdued, artistic effects. Physical comfort and the conservation of our vision has had little, if any consideration. If in the past decade we had put on aggressive lighting programs each year comparable to those of our other services, such as electric cookery, refrigeration, hot water service, table cookery, and the application of farm devices, we would today have a much better lighting load, and our business would not have suffered during the depression in the manner that it has, since our residential revenue did not decline as did our commercial and industrial loads.

Science has now opened a new field of endeavor for us, one that bids for our earnest attention and naturally has possibilities for rendering the customer a real service that is also productive of good will and revenue. With the advent of the sight meter we are able to go to our customers, tell them what has been going on in the seeing world and demonstrate the need of more light as a good investment.

Home Lighting Department

In the Northwestern Electric Co., the first step to promote better lighting was to employ one girl. This girl was given a thorough training in public relations, company policies, in addition to the General Electric art of home lighting and demonstration course. Our next step was to get our lighting story and demonstration over in an effective manner to as many of our customers as possible without too much lost motion. We set up a house-to-house plan testing customer reactions in several districts. Because of economic conditions we found that satisfactory results could only be expected at this time in those districts representing the higher income brackets. Cards were prepared and mailed to each customer a day or so in advance of calling, announcing the purpose of our service. This has aided materially in obtaining customer response.

Each girl is given a selected residential territory in geographic order. Residential customers are worked on every street in the territory. Demonstrations are made with the story of the science of seeing given and recommendations made out in written form for changes in the lighting of the home of each customer where faulty conditions are found. A great deal of interest is shown by our customers and in many cases the purchase of new lamps is made immediately. Frequently orders are taken for lamp bulbs at the time of demonstration. Two or three weeks after the original call and demonstration is made, each girl is requested to make a recheck, and a copy of the recommendation sheet is gone over with each customer to determine the actual changes made and the load increases. The actual load increase is the amount credited against each girl's monthly quota. Before each territory is completed in the present activity, recheck is made to contact customers that were not at home on the first call.

The girls employed have been thoroughly trained in good home lighting practice with a course in public relations as well. They are taught to develop electric appliance interest and to obtain prospects for appliances. Appliance survey cards are used and a check is made of all appliances in each home, the condition they are in, and customer comments noted. This is a permanent activity and will be continued with relatively the same setup until our experience dictates improvements.

We have received many reactions from our customers to this new lighting service. Some customers are exceptionally enthusiastic and give us the names of their friends whom they think would be interested in this service also. Sometimes customers who did not seem particularly interested during the demonstration surprise us when the lighting girl makes a call back, by following all the suggestions that were made and being eager for more. It is almost impossible to do a complete lighting job in one call. Call backs are important, as the woman can be induced to go one step further with her lighting, perhaps in general lighting, particularly if she has added higher wattage globes in her portable lamps. Recommendations are usually carried where possible to other rooms in the house.

For example, on a call back one of the girls was met by the man of the family. He said, "Oh yes, I have a 100-watt globe in my bridge lamp, but I don't like it!" As the girl started to say something he hurried on with "Oh, my wife told me I wouldn't until I bought one of those new kind of lamps, and I guess I'll have to. She won't let me take the 100-watt globe out as she says it is better for me." This is a typical reaction when large globes are added and the general light in the room is not stepped up also. When the lighting job is really completed there is no more "spotty" lighting. The girl who had sold the woman in the case just cited had convinced her that adequate light was necessary for her husband's eye comfort.

The reactions of our customers to the temporary use of a three-light lamp have been very gratifying. After the girl has told the customer about what the three-light lamp will do for her and shown her pictures of it, she offers to let her try one in her own home for a few days. During one month thirty lamps have been sent out on trial. Eleven of the users of these lamps purchased one almost immediately after

* A report of Residential Sales Bureau, Business Development Section.

they were removed. Eleven more expect to purchase very soon. On six of these lamps there has been no report as yet, and only two people reported that they would not purchase at the present time.

Cooperation with Eye Specialists

We cannot emphasize too much the value and importance of cooperating closely with local optometrists and other eyesight specialists. In the past sixty days one optometric organization alone has given us the names of fifty of their patients with requests that lighting recommendations be given. A copy of the lighting recommendations made to each customer is furnished the optometrist, indicating the conditions found as to general lighting intensities and the light for close work in foot-candles. The optometrist then endeavors to have his patient adopt these recommendations.

Nine Months' Results

During the first nine months of the year in Portland we employed seven girls who worked in periods varying from one month to nine, or the equivalent of six full time girls working three full months. Two thousand five hundred forty-one customers were contacted, a total of 1,496 demonstrations made with 341 kw. recommended and a total of 101 kw. installed, with an estimated revenue of $2,020. The average wattage recommended was 228, and the average installed was 145.

With five girls and one supervisor in the field, figures for the last three months of 1934 are shown in Table I.

Cooperation with Dealers

Our home lighting girls in the past few months have created a considerable amount of customer interest in the new I.E.S. lamps, Renu-a-lites, Pin-It-Ups, etc., and caused the sale of many units, all sales being made by the dealers.

To stimulate dealer activity in the new lamps an all-dealer portable lamp campaign was put on last fall in cooperation with the Portland General Electric Co. Both utilities sponsored an extensive newspaper advertising program for the promotion of dealer sales and a series of attractive posters on the value of better lighting in the home were furnished each dealer. Inability to obtain lamps during the campaign was our chief problem, and although this effort did not create a large amount of business, it unquestionably did emphasize a new lamp market to the dealers and develop new interest with the customer for proper home lighting.

While many of the lamp dealers stock I.E.S. lamps, some of them have been hesitant in stocking them, being anxious to clear up some of their present stock of the more conventional type, which they feel will soon be obsolete. We believe that as soon as this situation is taken care of we can expect greater cooperation from this source. As already mentioned, we have a practice of putting the three-light lamps in the customer's home on a trial basis, suggesting that they purchase the lamp from the dealer.

Educational Work

If we are to develop a public consciousness for better light in the home, then publicity and educational work becomes a very important thing. In this respect we must take advantage of every opportunity.

In the past eight months, in cooperation with the Portland General Electric Co., the General Electric Co. and the optometrists, a log of these activities shows that talks on the importance of good light for eye conservation were given before the following groups: Thirty-seven before civic clubs, such as Kiwanis, Rotary, and the Portland Chamber of Commerce; 18 Parent-Teacher Association groups; 7 school assemblies; 3 farmers' grange meetings; 6 courtesy radio interviews have been broadcast; and 5 school board meetings. The Portland school board has authorized a check of lighting conditions in all the Portland schools, and the results of the test will be available in several months. Additional talks were given before 6 community groups; 10 dealer groups; 8 lighting demonstrations before groups on our sales floor; and also numerous talks before employees.

The week of February 10 designated by the American Optometric Association as Save Your Vision Week was observed through proclamation by the mayor. News articles on proper lighting and the importance of eye conservation were published by the local newspapers. Three-minute radio talks were also broadcast by several of the radio stations.

Through the optometrists, we were able to install a complete optometric clinic in our window, where an optometrist was kept busy during the day giving free visual examinations to employees and others from the outside. This was supported by commercial and residential displays advocating proper lighting.

In cooperation with interested groups, action was recently taken in Portland to set up a state organization to be known as the Better Vision Council of Oregon. It is contemplated that this organization will have representation from such groups as the National Safety Council, Manufacturers Association, Parent-Teachers Association, paint and glass interests, architects, women's clubs, school authorities, State Accident Commission, the medical profession, light and power companies and the lamp manufacturers. The optometrists have been particularly helpful in getting this organization under way. Through the council we will continually seek to disseminate information of an educational value to the public in various parts of the state that will stress the importance of good lighting and the care of our vision.

During all of our Better Light-Better Sight program, we have carried on an extensive series of newspaper advertisements. We have used in this advertising such captions as "Your Eyes Overwork in Fog Light"; "Fog Light Will Use Up Your Nervous Energy"; "If Your Eyes are Bothering You Do These Two Things—See an Eye Specialist and Banish Fog Light"; "I Never Shop There Any More Because I Can't See"; "Your Eyes Are Slow to Complain—Don't Ruin Them"; "A New Free Service to Protect Your Eyesight."

In addition to these advertisements we have carried on weekly radio programs telling the value of good lighting in relation to good eyesight in educational stories and in interviews in dramatic form. Letters are constantly going out to lamp and retail fixture dealers and all eye specialists, keeping them in touch with our activities. Announcements have been frequently sent out with our service bills telling the value of good lighting.

Recommendations

As a result of our experience we submit ten recommendations for consideration in the development of any home lighting sales program:

1. Home lighting window displays that will be educational in nature should be constantly kept in use. Action windows are particularly good and have very strong drawing power.

2. There is a definite need for more artistic lamps in the I.E.S. type. A great many of our customers are not

TABLE I

Month	Approximate Calls	Total Demonstrations	Recommended Kw.	Installed Kw.	E. A. R.	Av. Installed Wattage per Home
October	1,011	249	71	59.7	$1,194	222
*November	629	151	49	55.5	1,110	252
*December	606	143	50	43.0	860	262

* Illness and the holiday season interfered considerably with our results during November and December.

interested in conventional types that they feel will soon be commonplace in every home. Better lamps will create more interest in higher lighting intensities.

3. All dealers should constantly be urged to price all portable lamps with bulbs. This will give them an additional sale and establish the use of proper sized bulbs in the lamps.

4. We should be liberal in our recommendations for high lighting intensities in the home, because well-diffused general lighting is impressive, and a pleasant service is rendered the customer. We should also keep in mind that too many customers do not put in a full recommendation in their living rooms or other rooms. A slight increase in wattage is hardly ever beneficial to the customer or to ourselves.

5. We find that the kitchen is the best lighted room today, and the living room the poorest lighted—yet the most used—room in the house. The average living room should have not less than 1,000 watts, and in most cases 1,500 watts for comfortable vision, with a minimum of 10 foot-candles in general lighting.

6. A particular effort should be made to interest all employees in good lighting in their homes, which will be enjoyed and stand as examples of proper lighting in every neighborhood. This will intensify employee interest in better lighting and develop prospects through them.

7. Any home lighting program should include a systematic follow-up of all new residence building and home remodeling jobs. Through the Federal Housing Act program there is a real opportunity to install better lighting in the older homes. We find the customer particularly anxious to put in good lighting when remodeling.

8. Consider the importance of making it easy for the home lighting advisor to be recognized for the work she is doing from other sales people when making her initial calls. We found it advantageous to have the lighting kits painted white. All our advertising in newspapers and radio have featured "the girl with the white bag."

9. Advertising must be impressive and even alarming in its nature if it is to be effective. In support of good educational copy, some poor phrase as "nine out of ten have poor lighting in their home for visual comfort" might be used constructively. It is our job to awaken the customer to the value of higher lighting intensities as a means of at least partial eye conservation and avoidance of the waste of nervous energy.

10. The conservation and protection of our vision is the real humanitarian service which home lighting girls are offering. This new story of seeing should be constantly emphasized in all advertising and in every contact with the customer. The lessening of eye strain and nervous fatigue is the selling point that is of paramount importance.

Improved Technique Needed

Anyone who anticipates changing the present lighting standards in the home from one of bare necessity or semi-darkness to decent lighting of impressive benefit to the customer and ourselves in a short time is doomed to disappointment. It is doubtful if the beacon of publicity and educational programs that has centered its beam on Better Light-Better Sight has so far returned satisfactory results in revenue. We can hardly expect to lift customer lighting standards with one breath of action, nor can we measure the actual amount of good accomplished.

After much contact work with Parent-Teacher groups, these groups have consented to make Better Light-Better Sight one of the important topics of the year's program. This is a real step forward because the organizations and school body represent the entire home life of any community. There is no better source for securing effective results at comparatively low cost.

We believe that the last six months of experience and selling in the Better Light-Better Sight activity has produced tangible results, but more important, it has suggested changes in selling technique that are vital to a successful program.

In marketing a specific merchandise or service, past experience usually dictates a certain selling theory. In the final analysis, a market activity usually determines the soundness of that theory. The most progressive idea of perhaps infinite value to humanity in the large sense must be sold. That is the point we have not trained our attention sufficiently upon as yet in home lighting. The science of seeing story has been told and many fine recommendations of increased wattage in the present day "spot lighting in the home" have been adopted and carried through, but it is not the best answer to better lighting and hardly increases the general lighting for real eye conservation. It does not leave a definite mark of service with the customer that will be long appreciated.

The story of good light for eye welfare must be told more vividly. Better light with present equipment or very minor changes, other than larger globes, must be advocated more often. Too often the suggestion of purchasing shades and new portable lamps will forestall better light with the present fixtures that the customer might enjoy. We should keep in mind that at the present time more eyes are injured from lack of light than are injured from glare. We must sell the customer an impressively higher general lighting intensity and the idea that it is worth more than they pay for it. Better Light-Better Sight means an over-all higher lighting intensity that will bring comfort and relieve eyestrain. To encourage the use of bulbs in every socket and fixture in the home at all times, with higher wattage in many, would be a real service beneficial to us and to the customer.

A significant step forward in the Better Light-Better Sight movement is the fact that our local optometrists are making definite recommendations to their patients in foot candles of light for reading and general use in the home. Some are now changing minimum recommendations from 10 foot-candles to 25 foot-candles for reading. This is splendid cooperation toward eye conservation.

While our Better Light-Better Sight program was not fully under way until the fall season and estimated revenue from customer load increases of accepted recommendations will approximate $6,500, additional revenue may be expected from recommended installations that are not put in immediately by the customer. The effect of advertising already done and the educational publicity from national magazines, periodicals, newspapers, and numerous other sources on the subject will be of utmost value in establishing popular acceptance of the need of eye conservation through better lighting during 1935. With eight home lighting girls in the field in 1935, three of them eight months of the year and five full time, we have set a quota of 1,100 kw. with an estimated annual revenue of $22,000. Educational activities similar to those carried on in the past eight months will be continued to help make our program a success.

Our Home Lighting Problem for 1935*

By W. E. POTTER
Incandescent Lamp Department,
General Electric Co.

DURING 1934 most of the utilities operating in the territory of the Northwest Electric Light & Power Association have started and are operating home lighting service departments with trained women contacting the residential customers in the home to give a complete demonstration of the adequate use of electric service to meet the "seeing" needs for various tasks. Customers have not only materially increased their use of electricity for lighting but have experienced a great appreciation of the service offered.

At this time there are 65 women calling daily on the customers of the utility companies in the territory. Twelve supervisors are assisting these women. Each of these people is equipped with a complete home lighting demonstration kit. Over 200 sight meters are in use daily by these women and in the various offices of the companies. It is impossible to estimate the number of additional sight meters in the hands of sales people in the various department stores, lighting contractors, factory representatives and optometrists.

The Proper Plan

Results prove conclusively that the only effective method of achieving the results desired is through a personal call and complete demonstration in the home. Most utilities are operating on a basis of calls by appointment only; some companies have used the cold canvass method rather successfully. A letter or card previously sent by mail assists materially in opening the door of the customer to the demonstrator.

1. *Personnel*—This type of work requires the highest type of saleswoman. She must be well-educated, intelligent and aggressive. A college training is not a necessity but is a distinct asset. A young woman, between 24 to 30, usually has the enthusiasm and pleasing personality necessary to carry her along when some customers become unresponsive to her efforts. The most important element required is tact.

The salary received by these women varies from $65 to $100 per month with the average $78. One thing to be remembered is that if the girls are to represent the companies properly, they must be paid wages sufficient to permit them to keep up a respectable appearance. A tactful, aggressive, enthusiastic salesperson working outside daily requires more compensation than an ordinary office employee. Climatic conditions in our territory are much harder on clothes of the outside worker. The difference upon the purse of the employee in shoes and hosiery alone as well as other clothing is surprising. By no means should these employees be dressed flashily or in extreme styles.

Furthermore, it must be realized that replacements will have to be made in this work the same as in other departments of the business. If, after a period of at least six months, an employee cannot produce additional revenue to justify her work, she should be replaced. This activity is a year round job and should be planned accordingly. The proper type of personnel cannot be obtained nor results achieved if the work is placed on a seasonal basis or for a few months only out of each year.

2. *Education of Personnel*—Most companies have been allowing a week's training period. This should be in the nature of a school with a thorough grounding in the fundamentals of lighting, science of seeing and its application in the home, company policies with lecture work, home study and actual home demonstrations and practice sessions. It is most effective to allow enough time for the new employee to become familiar with the story. During the second week actual demonstrations should be made in the homes of friends, employees of the company and dealers. The proper and adequate time spent in the first training of the new home lighting girl will more than pay for itself when she starts to produce.

After a thorough training in the new story of seeing, a good demonstration job should average not less than 40 per cent or more than 60 per cent of the recommendation as an immediate increase. If immediate results are less than 40 per cent, it indicates the customer has not been sufficiently sold on the need for more light. If more than 60 per cent is obtained, it indicates that the recommended intensity has not been high enough to satisfy the actual "seeing" needs in that particular room. It is known from the science of seeing that the eye will select intensities greater than 100 foot-candles for most visual tasks.

3. *Supervision*—It is preferable to have a woman supervisor with previous "firing line" experience, as she must supply enthusiasm for the girls not only weekly but daily. Without this experience she cannot know many of the problems actually confronting the demonstrator in the home. Each supervisor should handle at least six women and not more than ten.

The supervisor should handle the majority of all outside talks. This is most effective with the audience and more advantageous from a time standpoint as far as the company is concerned. Occasionally it is acceptable to allow others to make the talks, as the experience gained is of value, but much less productive time and effort is wasted on the part of the demonstrators if this work is handled by the supervisor. The same is true as far as contact work among the electrical dealers and department stores is concerned. Many department stores greatly prefer to deal with one person than with several and that person should be the supervisor or department head.

4. *Follow-up Calls*—Call backs on all original calls and demonstrations are important. This routine is not only for the purpose of checking results of the work, but also for making additional contact, paving the way for future calls on this customer. After a favorable impression on the customer has once been made, it becomes an easy matter to contact this customer later on other classes of electrical service. Call backs result in an opportunity to recommend additional wattage, and a satisfied customer is the greatest source for additional prospects for augmented electric service.

5. *Equipment*—All home lighting girls should have a complete kit fully equipped with the necessary MAZDA lamps of various sizes, sample shades, photographs and the sight meter. Without proper material the home lighting girl cannot demonstrate to the customer effectively the need for and betterment of adequate lighting.

In one case, the girls are working in crews, with a car stocked with various Mazda lamp bulbs, portable floor lamps, I.E.S. lamps and sample shades. This method materially helps to place equipment on the lines.

6. *Records*—Naturally records must be kept to a minimum. However, several companies are not keeping sufficient records to permit accurate check of the results of the girls' work. It is believed that the following records of each girl's work are necessary:

* A report of the Residential Sales Bureau, Business Development Section.

Number calls per day.
Number calls back per day.
Increased wattage recommended.
Increased wattage installed initially.
Increased wattage installed on call back.
Equipment recommended (fixtures, bulbs and shades).
Equipment actually installed (fixtures, bulbs and shades).
Equipment sold direct and through dealers.

At least every six months a check back should be made on a minimum of 200 customers to determine the kilowatt-hours actually consumed by the customer as against the same period a year ago. This check will show not only the value of the work done but also the competence of the employee doing the work.

One company reports a very interesting fact, that the average wattage increase per call from conversion to rated voltage of lamps operated 5 volts under rated voltage has been 56.3 watts, exclusive of all other recommended changes. It is surprising the number of 125-volt lamps operating on 120-volt circuits, and the effect of this condition in revenue lost to the utility company is well known. All the girls report that the customer appreciates this part of their demonstration most highly.

7. *Merchandise Sales*—Many companies are actively merchandising portable lamps and shades along with Mazda lamps. Local problems govern lamp merchandising. While it is true that a company need not always be a direct merchandiser, it is equally true that every possible effort should be made to facilitate the purchase of the right kind of equipment for use in the home. After a good demonstration most customers are anxious to make the recommended changes to improve their lighting through use of proper Mazda lamps. Many demonstrators are delivering the lamps the following day, thus enabling them to get the increased load immediately and with a minimum of expense and effort.

Today the lamp departments of the better department and furniture stores are anxious to cooperate with the home lighting girls. They are seeking assistance in the selection and merchandising of the better lighting lamps. This is a great stride in the right direction.

During the past fall many lamp buyers and sales people from these stores attended the home lighting institutes conducted by the General Electric Co. in our territory. Buyers are anxious today that their salespeople be trained in the new "seeing" story. This presents an excellent opportunity for the lighting staff of the utility company to arrange the necessary schools and lectures for these people. A series of lighting lessons is available through the Mazda lamp manufacturers to assist in this work.

A few stores have installed fitting rooms in which the customer can actually see how a new portable lamp will appear in use with her particular type of furniture. These stores report a marked decrease in the number of returned lamps as well as increasing lamp sales. Furthermore, this method offers an exceptional opportunity for increasing the sale of furniture.

One word of caution. Due to the vast public acceptance of the new I.E.S. study lamp, we find that these lamps have been sold for and placed in use in locations for which they were not intended. Let us not attempt to use them for lighting an office in place of correct ceiling fixtures.

Today the optometrists in our territory are particularly desirous of tying in with the activities of the Better Light-Better Sight program. Home lighting girls should be extremely careful to explain to the customer that lighting alone will not eliminate glasses for the defective eye. The lighting group must cooperate with the optometrist to obtain the greatest possible benefit in the work. Close cooperation will assist materially in securing prospects for demonstrations. It is reported the optometrist group alone furnish the demonstrators with 25 to 40 per cent of their leads.

8. *Executive Interest*—It is necessary that company executives be regularly informed of the activities of and results secured by the home lighting women. A knowledge on the part of a saleswoman that the executives are interested in her work, is a most stimulating incentive.

9. *Unified Direction*—The home lighting girls should operate not only under a direct supervisor but under a lighting director. The lighting director should also be responsible for the commercial and industrial lighting men with a supervisor to assist in this department. This lighting director should be not only a technically trained lighting man but a person with commercial sales training to cooperate with the advertising and merchandising departments in the development and coordination of lighting sales campaigns.

10. *Results*—In the group of utilities operating home lighting departments, the average of calls per girl per day is 2.57. This varies by companies from 1.9 to 3.5 calls per girl per day. This average is close to the best recommended average of three calls per girl per day. Call-backs average 1.9 per girl per day, varying from 1.5 to 3.0 call-backs per girl per day.

Two other interesting figures are the average watts recommended per home and the average wattage increase per home. The average wattage recommended is 389 watts per home. This varies by companies from 210 watts to 497 watts per home. The average wattage increase is 261 watts. By companies this runs from 110 watts to 334 watts.

It is generally conceded that the average wattage recommended per home for the living room alone should be from 400 to 600 watts with an immediate increase installed from 210 watts to 275 watts. A complete study of the recommendations and demonstrations given should be made regularly by the supervisor. Where low wattage installed is found, it means that the representative must revise her presentation and "seeing" story. Her recommendations may be incomplete or she may be too technical or fail to tell her story from the customer's viewpoint. This certainly is a job for the supervisor.

Above all, the recommendations made must be maintained at a high level. They must be sincere and complete in all details even though the customer is not ready to accept all of them at this time.

In conclusion, a well rounded program of home lighting is definitely needed. A mass of advertising without proper sales follow-up may not produce enough revenue to justify the expense. A high pressure portable lamp sales campaign without selling the need for use of the higher wattages will produce only temporary results and low wattage bulbs will soon replace the larger ones. A merchandising activity and a lighting activity not properly coordinated may each ruin the other. Mazda lamp sales of proper wattage are of greatest importance to the development of lighting load.

(Note—At this point Mr. Potter introduced a skit designed to show how a typical home call can add in the average living room an additional lighting load of over 800 watts or a connected load of 1,060 watts. This skit was acted by two home lighting representatives, Harriett Klumpp, home lighting supervisor, Northwestern Electric Co., and Corliss Guy, Puget Sound Power & Light Co.)

Engineering and Operation Section† + + +

Introductory Statement

THE twelfth annual general meeting of the Engineering and Operation Section, held at the New Washington Hotel, Seattle, May 9 to 11, 1935, proved to be the best attended Section meeting in recent years. The total registration of 180, eighty-one of whom came from outside the city of Seattle, represented a substantial increase in attendance over the previous year, when the total registration was 146. The quality of the papers and reports presented during four long sessions on the first two days of the meeting was of high standard of excellence and the discussions were most timely. William S. Hill, Grays Harbor Railway & Light Co., chairman of the section, presided, but had each of the chairmen of the four major committees conduct the program of his committee.

Practically all the papers and talks presented at the meeting are published in the following pages, or have been previously published in earlier issues of ELECTRICAL WEST as indicated. Such features of the program as are not published will be referred to here.

The morning of the first day, L. R. Coffin, Puget Sound Power & Light Co., President of the association, welcomed the delegates and keynoted the meeting by stating that the engineers at the present time had their biggest opportunity in finding means of using existing plant to a higher degree of efficiency. He pointed out that revenues were not increasing as fast as kw.-hr. sales, and that just as business seems to be getting better something like the present strike in the lumber industry descends on the industrial world of this territory to retard progress. The engineers have a definite place in the picture of bringing the industry through its present critical situation, and, having always in the past met their responsibilities, it is reasonable to presume they will do so now.

Following Mr. Coffin, J. B. Fisken, The Washington Water Power Co., chairman of the General Committee, was given the floor and he announced there would be no report from the Power Systems Engineering Subcommittee, but that reports would be heard from the Accident Prevention Subcommittee, and the Code Subcommittee. Toward the end of the morning session, Norwood W. Brockett, formerly of Puget Sound Power & Light Co. and one-time president of the association, and now an honorary member, was introduced to the meeting.

The afternoon session opened with the program of the Production and Generation Committee under J. E. Yates, Pacific Power & Light Co., chairman, who pointed out that the papers produced under his committee program fell in line with the keynote of the meeting sounded by Mr. Coffin.

The Utilization Committee held the stage on the morning of the second day, and Paul P. Ashworth, Utah Power & Light Co., chairman, prefaced the presentation of his program by indicating that his committee's work was pointed toward load building.

An address analyzing the fundamental premises on which our industry is based was delivered by L. T. Merwin, Northwestern Electric Company, at the close of this session. Mr. Merwin's talk is reproduced hereinafter in summary form.

The afternoon of the second day was given over to the Transmission and Distribution Committee under T. A. Purton, Idaho Power Co., chairman. One of the papers read during this session pertained to trends in transmission theory and practice by H. L. Melvin, Electric Bond & Share Co., New York. This paper is not published.

On each evening during the meeting and on Saturday morning, inspection trips were offered to the visiting delegates by the local committee headed by George E. Quinan, Puget Sound Power & Light Co. Points of interest visited by the delegates included the White River and Baker River power plants of that company, automatic substations serving metropolitan areas of Seattle, the a.c. underground distribution system, and the electric steam boilers using surplus capacity of the company for generating steam for the company's central heating system.

†Executive Committee: William S. Hill, Grays Harbor Railway & Light Co., Chairman. J. Hellenthal, Puget Sound Power & Light Co., Vice-chairman.

British Columbia Electric Railway Co., A. Vilstrup; The California Oregon Power Co., J. C. Boyle; Eastern Oregon Light & Power Co., O. D. Lanning; Idaho Power Co., T. A. Purton; The Montana Power Co., H. H. Cochrane; Northwestern Electric Co., J. D. Ellis, O. L. LeFever, E. F. Pearson, S. B. Clark; Pacific Power & Light Co., H. H. Schoolfield, J. E. Yates; Portland General Electric Co., C. P. Osborne, Walter Brenton; Puget Sound Power & Light Co., M. T. Crawford, G. E. Quinan; Utah Power & Light Co., Paul P. Ashworth; The Washington Water Power Co., E. H. Collins, J. B. Fisken; West Coast Power Co., C. P. Eliot.

Fundamental Premises on Which Our Industry Is Based*

By L. T. MERWIN
Northwestern Electric Co.

THERE is a good deal of loose thinking about the electrical industry. Engineers are supposed to think clearly and there are a few fundamentals that should be kept in mind in all your thinking relative to this industry.

In analyzing the electric utility, we find that it is a combination of money, material, labor, and management plus two vested rights granted by the people. These two vested rights are the right granted by the community to use public streets and highways, and, in the case of most of our companies in the Northwest developing hydro-power, the right granted by the state or Federal government to use natural resources.

Our first premise is absolutely fundamental to any intelligent consideration of the utility business. It is that the field of supplying light and power service to the public is a legitimate field for private endeavor. This has been so for over 50 years and it must be agreed to by everyone who is not a socialist.

If this is so, then our second premise is that the utility business must be based on the profit motive. Now the profit idea brings up the question of money, and I call to your attention that there are two kinds of money involved in the utility business: First, there is borrowed money, evidenced by the promise of the corporation to pay a fixed interest return on the money borrowed,

*This talk was delivered extemporaneously and was not written. The following is a summary of the points covered and is not a verbatim report of the talk.

and eventually to pay back the principal, and this is usually evidenced by a bond; and second, there is a proprietary or ownership money which is put into the business by the owners of the corporation, and this is evidenced by some form of stock certificate.

In our capitalistic system, money, like labor, is entitled to a going return, or value, or wage. Interest on bonds represents this kind of return as the wage of money and should not be considered profit. The return on the proprietary or ownership money, however, in the form of dividends on stock, might be considered partly profit. My thought is that up to the extent of the going wage of money represented in these dividends, it is not profit. Only that part of the return, if any, above this going wage, should be considered profit. As we all know nowadays there is very little profit, if any, in this business, and in fact it is difficult enough to get out of it the simple going wage of money.

There is, incidentally, a growing feeling among a portion of the public, that there should be no more than a going wage of money as a return for any business such as ours. Actually, I believe that there should be at least a modicum of return above the going wage so that the business can be carried through just such an emergency as we have been going through for the past few years and are not out of yet. It is well in any discussion of this phase of the subject to ascertain from those with whom you are talking just what their conception of profit is.

Our third premise is that since we are an essential public service, there should be governmentally imposed regulation. This is both necessary and desirable, for although it tends to limit an undue profit being earned in the business, and is sometimes a nuisance, it is also sometimes a distinct protection to the corporation.

Due to the increasing draft on natural resources, recognition must be given to the public character of these resources. Some people think all water power should be exploited only by public agencies. I do not believe in this theory, however, since it has been due to private endeavor that these water resources, in common with many other natural resources, have in the past been developed for public use. Therefore, I cite, this as our fourth premise, viz., that natural resources should be developed by private endeavor when the interests of the public in these resources are properly protected by governmental regulation of such exploitation.

This does not mean the people working through governmental agencies should not develop any of these water powers. There are a number of uses of our rivers and streams having a large bearing on public welfare that are not of the character of commercial enterprises. I refer to navigation improvements, flood control, irrigation and soil erosion. These uses to which our rivers may be put, seem to fall quite strictly within the function of government, and when the government develops a river for these purposes, it is frequently in keeping with economics to install a certain amount of power development as an incidental adjunct to the dams that must be built in connection with fulfilling these other functions. Therefore, I cite as our fifth premise that governmental development of power should be limited to only that power coming about as a necessary concomitant of a larger program of river development. This, incidentally, is the substance of a recent legal opinion regarding the activities of the T.V.A. and I do not believe anyone in the utility business will complain of this interpretation of the government field in power development.

As our sixth premise, I would say that the government should not compete with its citizens in private business. Such competition has always resulted in loss to the private business suffering the competition. We are, however, dealing with a public state of mind at the present time, and we can't stop some of these forms of government competition. What we must do is take protective measures against the damaging results of this competition.

I am referring now to the competition we are facing here in our own territory through the government development at Bonneville and Grand Coulee. We may assume that these power developments are a concomitant of a larger and general development of the natural resources of the Columbia River, and, further, that this power should be used in public service. There is no reason, however, why the private utility industry, and not the government, should not distribute this government owned power on the ground that utility service, as such, is a legitimate field for private endeavor. The utility industry should not object to distributing this power on this basis. We are interested in rendering electric service and it should make no difference to us whether the source of the energy providing that service is our own generating plant or one owned by the government.

At this point I wish to interpolate an incidental thought. I wish the engineers would devise a unit of the service we sell. A kilowatt-hour is a unit of energy and not a unit of service, and what we need is some means of billing our customers so that an idea of all the variety of service they get from electrical energy is portrayed to them.

As our seventh premise, I cite to you that the utility is a tax collector. From 15 to 20 per cent of every dollar of our gross billings is now turned back to some governmental agency in the form of taxes. I wish we could find some simple way of portraying this fact to the public. The gasoline people do it admirably when they list their prices on the pump:

Gas	18c
Tax	05c
Total	23c

Our power bills ought to indicate to the purchaser of our service the true nature of our function as a tax collector, somewhat as follows:

Electric Service	82 Per cent
Taxes	18 Per cent
Total	100 Per cent

In conclusion I wish to leave this thought with you, that based on the foregoing premises which I consider fundamental to an analysis of our industry, we now need to coordinate our situation with the rapidly changing viewpoint of the public on problems involving the development of our natural resources.

Work of the Engineering and Operation Section

By J. B. FISKEN
The Washington Water Power Co.

I HAVE been asked by Chairman Hill to prepare and submit at this meeting a brief resume of the activities and accomplishments of the Engineering and Operation Section, and of the many men who have had a part in the continuous operation of the section since its inception. For the first three years the association had no engineering committees but several valuable papers were contributed by the engineers at the conventions. It was during the fourth year of the life of the association that the first engineering committee, the Committee on Overhead Line Construction, was appointed by President W. J. Grambs, and this committee submitted its first report at the Seattle convention, Sept. 3-5, 1913.

In this report D. F. McGee, as chairman, told how the electrical workers' union had succeeded in getting ordinances passed by the municipal authorities in Seattle and Portland but had failed in Spokane. Fearing that other cities would adopt ordinances which would be different one from another and thus create confusion, our association approached the Washington Public Service Commission with a request that a code covering state-wide construction be promulgated. However, the electrical workers, claiming lack of confidence in the Public Service Commission, introduced a bill containing a code of construction at the 1913 Washington legislature.

After a considerable "fight," the bill was passed and is still the law of the state as Chapter 130 of the Session laws of 1913. It is a disgrace to the State of Washington as it does not provide a full measure of safety, and some of the unnecessary requirements, as far as safety is concerned, have tended to increase the cost of construction. In a paper submitted at the 1916 convention by M. T. Crawford in which he discussed the law referred to, he stated that new construction of overhead lines is reported to be increased from 10 to 25 per cent in the case of city lines, and from 10 to 15 per cent in the case of rural lines.

In 1914 a crossing specification was prepared by the telephone interests and submitted to the Idaho Public Utilities Commission with a request that it be promulgated. Through the good offices of our Boise members, the commission delayed issuing an order to permit the power interests an opportunity to review the specification. After holding several meetings in Boise, arranged by our committee on Overhead Line Construction, and no agreement being reached with the telephone interests, it was decided that further discussions would have to be carried on with the telephone engineers in New York. I was selected to make that trip, and with the assistance of R. J. McClelland, then chief engineer of Electric Bond and Share Company, and his engineers, we finally reached an agreement which was satisfactory to both parties.

During this year the California Railroad Commission issued its General Order No. 39 in regard to inductive interference between power lines and communication lines and this proved to be a source of deep concern to our membership. The rules contained in this order were fully discussed by the committee and whether or not the criticisms launched against them were instrumental in preventing the issuance of similar orders by the commissions in our territory is on open question. At least no such orders have been promulgated.

Under permission given by the Congress in July, 1913, the U. S. Bureau of Standards prepared the first draft of the National Electrical Safety Code. In order to sell this code to the industry, Dr. E. B. Rosa, Chief Physicist of the bureau, accompanied by W. J. Canada, one of his engineers, made a pilgrimage through the country. Meetings were held with the bureau representatives at Portland, Seattle, and Boise, in May, 1915. The Committee on Overhead Line Construction represented our association at Portland and Seattle while the Idaho Power Men's Association looked out for the Idaho interests. Many criticisms were made of the proposed rules, and the committee prepared and forwarded to the N.E.L.A. committee in charge of the matter a vigorous protest against approval.

At the request of the A.I.E.E., the N.E.L.A., and A.E.I.C., a conference was held in New York in October, 1915, which was attended by over a hundred representatives and which continued for two weeks. George Quinan, J. C. Martin, and I were chosen to represent our association. Numerous suggestions for amendments were offered and were taken under consideration by the bureau representatives. A final conference was held in Chicago in April, 1916, at which Mr. Quinan and I were present, and a second edition of the code was published in December, 1916. Other editions have since been published. The code as it stands today is not all that we would like to have it, it is infinitely better than our present State Code and I feel that it was through the efforts of our committee that the first attempt of the Bureau was nipped in the bud.

Late in 1914 a hearing on overhead construction rules was held by the Public Utilities Commission of Idaho and representatives of the Committee on Overhead Line Construction took part in the discussions. The outcome of this hearing was the promulgation on March 1, 1915, of General Order No. 10. Several years later this order was rescinded and an order substituting Part 2, National Electrical Safety Code was issued.

Expansion of engineering work in the association lead in 1916 to the organization of the Hydro-electric and Technical Committee. Sub-committees, parallel to the sub-committees of the Technical Section N.E.L.A. were formed in 1917, and the following year representatives from our sub-committees were appointed to membership on the national sub-committees. Through this cooperation we were enabled to keep in close touch with the activities of the N.E.L.A.

At the 1919 convention, a new constitution was adopted which provided for four sections, of which the Hydro-electric and Technical Section was one, and shortly after I took office as president of the association, I appointed the members of the then defunct Hydro-electric and Technical Committee as members of the Governing Committee of the new section.

One of the first duties undertaken by the section, acting under instruction from the officers of the association, was to formulate a code of rules covering electric power plants and substations. This action was taken for the reason that the State Safety Board of Washington had announced its intention of formulating such regulations for all industries. The State Safety Board approved this plan and a code prepared by the committee was submitted to the board at a public hearing in Seattle in December, 1919. A full day was spent in discussion of the rules in detail after which they were unanimously recommended to the board by all parties, including the labor union representatives. The rules were never promulgated by the Safety Board but many of them are included in the safety standards adopted in 1923 by the Department of Labor and Industries, its successor.

Late in 1919 the Public Service Commission of Washington notified the industry that a new edition of the service rules, then in effect, was to be issued. As president, I instructed the Governing Committee of the section to study the rules and recommend any changes. In accordance therewith the committee prepared a list of changes to be asked for at a hearing before the commission, but no such hearing was ever held.

Prior to this year, the Prime Movers Committee of the N.E.L.A. handled all questions connected with prime movers, including hydro. As almost all that committee's activities were devoted to steam prime movers, we felt that a separate committee should be organized to consider hydro prime movers. At the N.E.L.A. Pasadena Convention, our arguments were given favorable consideration and as a result the N.E.L.A. Hydraulic Power Committee was organized. A similar committee was then appointed for our association with Markham Cheever as its first chairman. The records show the justification for this movement.

In January, 1921, the committee suffered a severe loss in the death of W. H. Trenner, who had been active in the work for several years. In this year the somewhat cumbersome name—the Hydro-electric and Technical Section—was dropped and the name Technical Section was adopted.

In January, 1921, the committee, acting under the instructions of the Executive Committee of the association, undertook the development of a uniform policy for making line extensions to serve new territory. After several conferences a line extension policy was finally developed and was approved by the Executive Committee of the Technical Section and a majority of the member companies in Oregon. Late in 1922 a code of rules, based on the code developed by the Technical Section, was promulgated by the Department of Public Works (Washington), the successor to the Public Service Commission, and became effective as Order No. 5370, January 1, 1923. This code was amended July 1, 1929, by order No. 6273. The code developed by the Technical Section was formally presented to the Oregon Commission on November 28, 1921, but was not adopted, though other rules of a less scientific character were promulgated in 1922. These were later revised and modeled to some extent after the rules which had been drafted by the section.

During 1923 members of the section were called upon to aid in establishing certain standards which the Department of Labor and Industries had under consideration in the State of Washington. Modifications and changes were suggested during numerous meetings and late in the year the safety standards were finally adopted. The department representatives throughout the different hearings gave an attentive ear to our suggestions.

Early in 1924 the need was felt of having a series of tests on pin type insulators, as the manufacturers' listings were not regarded as being satisfactory and the N.E.L.A. had not taken any action in the matter. Three educational institutions, the University of Washington, the State College of Washington and the Oregon Agricultural College, were approached and the only one of the three that was prepared or was willing to cooperate with us was the O.A.C. Not only did the college authorities cooperate but a mechanical test machine that was required was built expressly for this work at the expense of the college.

For some time the members of the Technical Section had felt that the work done was not as effective as it should be when its value is considered. It was felt that the general run of employees got practically no benefit from the annual conventions, as those in attendance were largely executives and heads of departments. It was felt that meetings at which the employees generally could be present, hear papers read, and take part in the discussions would be fully justified. With this end in view it was decided, and the proposition was approved by the Executive Committee of the association, to hold a purely technical meeting between the summer conventions of the association. The first annual general meeting of the Technical Section was held in Portland in March, 1924, and the unqualified success of that meeting fully justified the decision of the Governing Committee of the section.

Similar meetings have been held at Spokane in 1925, Seattle in 1926, Portland in 1927, Spokane in 1928, Walla Walla in 1929, Aberdeen in 1930, Wenatchee in 1931, Portland in 1932, Portland in 1933, and Portland in 1934.

The hydraulic developments in our territory introduced a serious problem in the alleged menace to the fishing industry. A sub-committee of the Hydraulic Power Committee was appointed with J. E. Yates as chairman to consider this subject, and this committee, in cooperation with representatives of the U. S. Bureau of Fisheries, has since then been carrying out numerous experiments. This is still a live subject.

Along in 1928 and 1929 the subject of radio interference was very much to the fore and the Inductive Coordination Committee felt that much might be learned by constructing a test line and conducting experiments on it. Again the O.A.C. came to our aid and undertook the desired experiments. The work carried on by Prof. F. O. McMillan of this institution has been very successful, as methods for treating existing insulators have been developed that materially reduce the inductance from high tension pin type insulators.

At the annual general meeting in April, 1933, the name of the section was changed to Engineering and Operation Section, and under that name the section is functioning today.

I have endeavored to cover the major accomplishments of the section, but these have formed only a minor part of the total activity. The major work has been in the regular routine of trying to develop ways by which costs of construction, maintenance and operation may be kept down. To attempt any recital of all that has been accomplished would occupy a whole session. The value of the work done by the section depends entirely upon the use which the company executives make of it.

I would not wish to close without acknowledging tribute to some who have worked with us in the past but of whose services we can no longer avail ourselves.

Ever since the beginning of our activities we have had active support from John M. Kincaid, H. L. Blecker, Norwood Brockett and Arthur Gunn, although none of them ever actually served on our committee. These men have all either died or retired. I have already made reference to the death of W. H. Trenner, whom we missed greatly. H. L. Walther was quite active for a time and he is now retired. When the great war put a crimp in the operations in Canada, Fred D. Nims gave up his position in Vancouver and crossed the line. For many years he was one of our most active members. L. T. Merwin was also active until he became a general manager. Another of the old timers who took part in our work was E. G. Robinson, a former president of the association. R. M. Boykin, F. J. Rankin, and Markham Cheever left the Northwest and went to New York, as did J. C. Martin and James B. Brokaw. Z. E. Merrill is in a managerial position and never comes to see us any more.

Had I more time I might carry my memory back and refer to others who are no longer active, and to tell of the accomplishments of those who are still active, but that will have to be postponed until some other time.

Inspection + Maintenance=Service*

By E. H. COLLINS
The Washington Water Power Co.

ONE of the problems of every operating group is how much regular inspection and regular maintenance shall be done to render proper service to customers. There are three main factors to be considered: first, amount of inspection; second, amount of regular maintenance or maintenance as the result of inspection; and, third, quality of service rendered. If it were convenient to meter these three factors, it would be easy to keep a balance in the equation, "Inspection plus Maintenance equals Service." However, some approximate metering of these factors by the use of indices which give a base to which may be added and subtracted exceptions would seem to be of value. This should be particularly true now that our systems have grown so large that all these factors are past the capacity of individual effort.

Inspection is of various types and may be accomplished in many ways. Under types fall inspections: first, by personnel that also operate; second, by personnel that also does maintenance work; third, by an outside group, such as the Engineering Department, where it is separate from the Operating Department; and fourth, by any combination of these groups. Under inspection may also be classed regular reports of reliability or charts graphically showing interruptions or other indices of operation.

Reports were received from seven Northwest operating companies relative to methods of inspection and standard forms used. Five accomplish inspection with combined operating and maintenance personnel. Two accomplish inspection with maintenance personnel only. All seven companies have engineering investigation of special cases.

The reports indicated the use of standard forms as follows:

	Companies
Transmission patrol	5
Substation inspection	4
Lineman's daily report	1
Interruption report	1
Reliability report	3
Pole inspection	3
Insulator test	3
Oil test	3
Cable test	1
Rotating apparatus test	1

In the papers by W. G. Williams (1) and J. Elmer Housley (2) mentioned later the following forms are shown in detail:

W. G. Williams

1. Report of Apparatus requiring special attention or repairs.
2. Master mechanic's inspection report.
3. Schedule of periodic inspections.
4 Reliability report.

J. Elmer Housley

1. Monthly inspection report.
2. Inspection report, hydraulic turbine.
3. Inspection report, hydraulic governors.
4. Daily report of repairs made.
5. Inspection report, oil circuit breakers.
6. Daily record of generating equipment, operation.
7. Record of switch operations by relay.
8. Inspection report, transformers.
9. Inspection report, Switchboards and relays.
10. Number of new brushes used, generators and motors.

It will be noted that some companies have a form giving necessary data to compile a reliability report. A study of the National Hydraulic Power Committee report on "Reliability of Hydro Units" indicates sources of outage hours as follows:

1. General causes such as ice, trash, penstock, canal and headgates are responsible for little trouble with propellor type and vertical reaction units while with horizontal reaction units considerable trouble has been caused with the penstocks and canals. This is probably caused by older installations rather than type of installation. It indicates, however, that more inspection must be had of these installations.

2. Trouble with water wheels and auxiliaries, in the case of propellor type units, cause over 90 per cent of the outages of which about 15 per cent is bearings, 13 per cent draft tube and 56 per cent is due to inspection and overhauling. In both the vertical and horizontal reaction units 6 per cent is charged to bearings. In the horizontal units 19 per cent is charged to runners. These are indications of needed inspection.

3. Generators show outages caused mainly for cleaning with rotor or field next in order except in the case of vertical reaction units where armature iron or windings cause greater outages. Generator inspection is relatively less important.

An annual compilation of this nature for the local operating company should be of value in indicating the weak spots in hydro generation. It will be noted that three companies in the Northwest report such use. A similar example is contained in a report of the National Prime Movers Committee relative to steam plants. Weak spots in transmission lines, substations and distribution may be analyzed by similar methods. The Edison Electric Institute Electric Equipment Committee has in process a study of equipment failure. A less laborious method, which of course gives less information, is to spot interruptions to service on a map by use of colored-head tacks. This method is advantageous as it is more striking visually. The weak spots will be quite evident by the large number of tacks. Various colors of tacks can be used for various causes and various voltages and apparatus.

Maintenance is of various nature. It might be divided into the following: Scheduled maintenance, such as painting of a structure every three years; maintenance as the result of inspection; and maintenance as the result of emergency or unusual causes. The latter two seem to be the most usual and the last often results from not accomplishing the second. It appears that proper inspection may be practiced but that indicated need of maintenance is not carried out for financial or other reasons.

It is believed that some items should have an arbitrary schedule of maintenance. These items are minor and often overlooked. One example of these items is packing. Coupled with this should be a sensible but not too conservative maintenance program as the result of inspection. With this program the emergency or unusual maintenance which is most feared will be considerably minimized. In any case a syste-

†J. E. Yates, Pacific Power & Light Co., Chairman. E. H. Collins, The Washington Water Power Co., Vice-chairman.

British Columbia Electric Railway Co., E. E. Carpenter; The California Oregon Power Co., Harry Olsen; Eastern Oregon Light & Power Co., O. D. Lanning; Gray's Harbor Railway & Light Co., W. S. Hill; Idaho Power Co., H. L. Senger; The Montana Power Co., J. C. Dow; Portland General Electric Co., Walter Brenton; Puget Sound Power & Light Co., A. L. Pollard, G. C. Sears; Utah Power & Light Co., L. B. Fuller.

*A report of Production and Generation Committee, Engineering and Operation Section.

(1) Mr. W. G. Williams, General Superintendent, Gatineau Power Company, has a report published by the Hydraulic Power Committee, Canadian Electrical Association, titled, "Scheduled Inspection and Maintenance of Hydraulic Plant Equipment." Part of this report is also published in the October, 1934 issue of Power. (2) Mr. J. Elmer Housley, Superintendent, Tallassee Power Company has three articles published in Power, "Organizing Hydroelectric Inspection and Maintenance," Power, July 14, 1931; "Maintenance Methods," July 28, 1931; "Maintaining Equipment in Hydroelectric Plants," August 18, 1931. (3) J. M. Flanigon, Assistant Superintendent, Retail Operations, Georgia Power Company published an article titled, "Operating Data That Pay," in Electrical World, April 27, 1935.

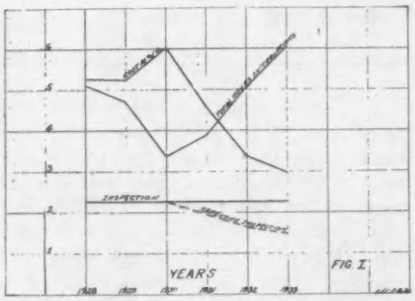

Fig. 1 — Curves showing relationship between inspection and maintenance and the frequency of interruptions

matic program of maintenance should be accomplished and sufficient records of condition kept to at least know what condition exists, and the relation of that condition to service.

The prime reason for inspection and maintenance is to render a service from which we derive our income. Quality of service is quite difficult to measure. No service, and continuous service are definite limits but the intermediate points are not easy to determine. In general we assume 100 per cent service and list lack of service in the form of interruptions. Not all interruptions can be eliminated by inspection and maintenance. It is believed a reasonable measure of service is interruptions after those resulting from unusual causes and causes beyond the scope of inspection and maintenance have been eliminated. An example of these causes is occasional storms which produce conditions beyond the limit of proper economical design.

The three factors of the equation, "Inspection plus Maintenance equals Service," have been discussed. As an example of the valuation of this equation Fig. 1 was made up with a small amount of effort. Costs, it will be noted, include both maintenance and operation. Since the data is relative and operation is contained in all years and is practically constant, it does not need to be eliminated. Such a figure can be readily obtained from the ordinary financial reports and requires no extra records. Total hours of interruptions is obtained from an inspection of interruption reports eliminating the unusual occurrences. Inspection is measured in man-days, hours or years and is not needed in great refinement. As evidence that this approximate measure of the equation is correct it will be noted that there are no inconsistencies except in inspection. That is, as more maintenance is accomplished, hours of interruption decrease and the opposite. In the case of inspection, it appears that it is sufficient because with maintenance accomplished, probably as the result of inspection, interruptions have decreased. It appears, however, in the last three years inspection was only effective as shown by the dotted line even though it was carried on as shown by the solid line. In other words, all necessary maintenance indicated by inspection was not carried out.

It must be borne in mind that Fig. 1 is only a single example of one form of valuation of the equation. Others would be developed as best fits the particular system, available data and character of organization and personnel. Each factor of the equation may be further analyzed. Also data may be assembled on a unit basis. In a current article in *Electrical World*, J. M. Flanigon (3) discusses "Operating Data That Pay."

It is believed that as a result of this study the equation, "Inspection plus Maintenance equals Service," can be solved with sufficient accuracy to tell when to spend, when to save and how most efficiently to use the dollar spent on inspection and maintenance.

Discussion

J. C. Henkle, Portland General Electric Co.—The volume of maintenance done has a bearing on the company's borrowing power. If you want to borrow money, you can't defer maintenance too long.

It is presumed that the use of the term "inspection" in the paper means also testing. Periodic tests on equipment pay dividends. The testing of rotating machines sometimes saves re-insulating. The operating of breakers periodically, say once a week, shows whether they are in operating condition and frequently forestalls a burn-out. Testing transformer oil periodically has saved serious burn-outs of transformers. These and similar kinds of inspection tend to forestall interruptions and save spending money on costly repairs.

O. L. LeFever, Northwestern Electric Co.—The effectiveness of inspection depends on the ability of the individual doing the inspection to interpret properly the findings of his inspection. All supervisors and foreman should, by keeping their eyes open on their regular work, act as inspectors, and should then exercise good judgment in reporting conditions needing maintenance work.

Some kinds of oil switches and other equipment need more frequent inspections than others. The frequency of inspections should be scheduled in proportion to the possibilities of failure of the different classes of equipment involved.

J. H. Siegfried, Pacific Power & Light Co.—Forms on which regular inspections are reported should be made comprehensive enough to give the department head the information he needs for judging whether maintenance work is necessary. This company has a schedule of routine inspection for different classes of equipment and tries to keep its maintenance expense level from year to year.

S. C. Lindsay, Puget Sound Power & Light Co.—Periodic inspection of the kinds of equipment that experience has shown us to need inspection is desirable. A record of the conditions found by inspection leading to trouble will show whether or not the company is spending too much money on inspection. I am not in favor of making every foreman and supervisor an inspector as a side issue of his job because what is everyone's business is nobody's business.

Paul P. Ashworth, Utah Power & Light Co.—Economic pressure has made us curtail to some extent both inspection and maintenance without materially hurting service. We make men responsible for the equipment under their jurisdiction.

A. Vilstrup, British Columbia Electric Railway Co.—The amount of accrual for renewals has a bearing on the amount of maintenance we do because frequently accruals are set up to replace certain equipment sooner than ordinarily would be necessary and this tends to make us slight the maintenance of this equipment.

Cooling Combustion Chamber Walls and Floors*

By H. H. FINCH
Grays Harbor Railway & Light Company

*Published in the April, 1935 number, Electrical West, page 39.

High-Speed Diesel Engine Costs*

By ARTHUR H. GREISSER
Portland General Electric Co.

BY the end of 1934 practically every American manufacturer of Diesel engines was marketing, or was developing, a line of the so-called "high-speed" power units. The term "high-speed" is commonly applied to full Diesel engines with a rotative speed of 750 r.p.m., or over, and the term implies light weight per hp. of engine rating. This relatively new development has become publicized through the use of Diesel engines for the motive power in modern railroad trains operating on faster schedules than the older type steam engines. At present, the high-speed Diesel engines are used extensively in powering large tractors, portable air compressors and heavy construction and logging equipment. Those uses in which the Diesel can show better performances and lower operating costs, compared with the gasoline engine, have given the Diesel engine manufacturer a sales volume sufficiently large to enable the price of the power unit to be set at a low level and thereby compete with central station power on certain loads with a very poor load factor. The power units are ideal for temporary installations where central station power is not available, and where gasoline engines or the slow-speed, heavy-weight Diesel would otherwise be used.

Truck transport operators in the Pacific Northwest are gradually replacing gasoline engines with Diesel units on those trucks engaged in long hauls. In such applications, the lower operating expense with the Diesel soon offsets its higher first cost. However, the oil engine has many other advantages over the conventional gasoline engine in truck and bus service, as will be mentioned later.

Practically every manufacturer of high-speed engines offers the models, exclusively, in the four-cycle, full-Diesel type with solid fuel injection either directly into the cylinders or into a precombustion chamber. One of the few exceptions in design is offered by the Waukesha Motor Co., which markets a spark-ignition heavy oil (No. 2 or 3 furnace oil) engine rated 161 hp. at 900 r.p.m. The complete line includes engines rated at 40 hp., to over 200 hp., of which design a total of some 1,200 are reported to be in operation.

*A report of Production and Generation Committee, Engineering and Operation Section.

This paper will attempt to outline the design characteristics and operating performance of full-Diesel engines now on the market, but it should be recognized that the high-speed Diesel engine is still in the development stage and important improvements in the engines can be expected in the near future.

This new development in prime movers has many notable engineering features. High rotative speeds and light weight per engine rated horsepower are gained by the use of heat treated nickel alloy steels for the crank shaft, connecting rods, valves and smaller parts. In fact, some engines use as many as eight different steels in the manufacture of moving parts other than the pistons which are commonly an aluminum alloy. Cylinder liners on some makes are centrifugally cast iron alloy which has a tensile strength of from 50,000 to 55,000 lb. per sq. in. and a Brinell hardness of from 228 to 600. The use of 15 to 30 per cent of chromium in cast iron produces a casting which shows practically no growth at elevated temperatures and is highly resistant to oxidation and scaling. Such metal is ideal for cylinder liners and piston rings. The cylinder blocks and heads are ordinarily made of special cast iron for lightness in weight and freedom from warping under high heats. Since bearing pressures in some high-speed Diesels are from two to two and one-half times that of the ordinary engine, steel or bronze backed bearings must be used for satisfactory performance.

By utilizing these special materials of high-strength and light weight, the cost of handling and machinery parts at the factory and in the repair shop is greatly reduced compared to the older type slow-speed engines. The physical dimensions and total weight assembled of high-speed engines permit the shipment of a complete power plant as a unit, thereby reducing freight charges, cartage and handling, and eliminating the necessity for a factory superintendent of erection. Likewise, cranes and heavy hoists are not required for engine erection and maintenance.

Starting of some units is accomplished by a 24-volt starting motor (battery operated), and a 24-volt generator of 250 to 1,500-watts capacity is provided for battery charging. It is generally recommended that two 12-volt batteries of 185 amp. per hr. rating be provided as a minimum of capacity. That size costs from $90 upward depending on the manufacture. One, two and even three-cylinder engines are sometimes hand cranked. The "Caterpillar" Diesel is started by a small two-cylinder, hand-cranked, four-cycle gasoline engine which is geared to the Diesel flywheel through a clutch which automatically disengages as soon as the main engine operates under its own power. For starting in cold weather, the exhaust of the gas engine can be used to warm the Diesel.

The "McCormick-Deering" tractor and industrial power Diesel are equipped with an auxiliary cam shaft which controls an extra valve on each cylinder. The valve, when open, adds an auxiliary combustion chamber and thereby lowers the compression pressure in each cylinder to the proper level for gasoline performance. A spark plug in each auxiliary chamber is energized by a high-tension magneto, and a conventional gasoline carburetor and manifold enables the engine to be started on gasoline by hand cranking. When the engine attains the proper speed, it automatically operates on Diesel oil through closing the auxiliary valves and disengaging the magneto and carburetor.

All the foregoing methods of starting are preferable to the complication of air starting compressors, piping, and air receivers used on the slow and medium speed engines. The advantage is in lower first cost and ease of maintenance.

In considering the purchase of a high-speed Diesel engine for power service, it pays to check into the design, materials and workmanship of the unit. Frequently, the engine that is highest in first cost will be the most economical and reliable. Various manufacturers do not provide comparable engine auxiliary equipment, so it is necessary to ascertain if all vital items are included in the engine quotation. Furthermore, the auxiliaries must be adequate in capacity, particularly fuel and lubricating oil filters, radiator, pumps for cooling water, radiator fan, starting motor and battery charging generator, and fuel oil transfer pump. Engine units for direct drives in stationary service should be provided with a high grade clutch, and a well-designed outboard bearing which will maintain the pulley shaft in perfect alignment.

Automotive Type Diesel Engines

The Diesel engines used in trucks and buses range in power from 50 to 135 hp., and are ordinarily governed for a

speed of 1,500 r.p.m., the top speed ranging from 1,500 to 3,000 r.p.m. One engine of English manufacture rated 73 hp. at 2,000 r.p.m., weighs only 8.9 lb. per brake hp., which weight is less than the heavy-duty gasoline engine of like power. However, bare engine weights are usually 14 or more pounds per brake hp. of rating at maximum speed, and 16 lb. or over for the governed running speed. The engines are almost universally of the four-stroke, solid-injection type, the principal difference being in the use of precombustion chambers as compared with direct-injection. The latter design is used in the truck Diesels with the greatest sales volume to date.

In England and on the Continent, the Diesel has gained wide-spread acceptance for the powering of heavy trucks and buses. At the close of 1930, it was estimated a total of only 90 Dieselized vehicles was operated in England. An estimate places the present number used in that country at 10,000, and practically every truck of 2½-ton capacity and over that was sold this year have been Diesel powered. Germany, which is the most progressive country in the development of the Diesel, has some 20,000 Diesel equipped trucks and buses on her roads. Those statistics are especially interesting because, in England at least, Diesel powered vehicles pay an extra road tax amounting to $100 more for a 5-ton truck than the road tax on a similar gasoline-engined truck. Most foreign countries charge the same, or even a greater tax on Diesel oil than the tax on the equivalent volume of gasoline, whereas, in most states in the United States, Diesel powered trucks are not subject to special taxes and escape paying the usual road taxes on gasoline.

American truck and bus operators are relatively slow to accept the Diesel engine, but its numerous advantages over a gasoline engine are bound to create a greater popularity for this prime mover. The principal advantages over the gasoline engine are as follows:

1. Better fuel economy because of high thermal efficiency, lower cost of fuel per gallon, and higher heat content per gallon of fuel.
2. Sustained torque over large ranges of speed.
3. Less fire hazard, and practically no possibility of fuel tank explosion—results in lower fire insurance rates.
4. Greater cruising radius without refueling.
5. Carburetor, electrical distributor, coil, and spark plugs eliminated.
6. Exhaust gases contain greatly reduced percentage of carbon monoxide.

The Cummins Engine Co. of Columbus, Indiana, has developed a line of Diesel engines for trucks and buses. That company reports one fleet of 70 trucks using the 4 and 6-cylinder models and another fleet using 25 Diesel units. The two Cummins truck engines most popular with operators are briefly specified as follows:

Four-Cylinder Engine: 83-hp. at 1,800 r.p.m.; bore, 4⅞ in.; stroke, 6 in; weight, 1,550 lb.

Six-Cylinder Engine: 125-hp. at 1,800 r.p.m.; bore, 4⅞ in.; stroke, 6 in.; weight, 1,955 lb. (350 lb. more than a heavy-duty gasoline engine of same power).

A feature of the Cummins engine is that company's system of pumping and injecting fuel to the cylinders. The fuel pump is of the single-plunger distributor type, and is supplied with fuel at 50 to 100 lb. pressure by a gear pump. The fuel metering device is unique because the fuel charge is measured at low pressure. Before the fuel is injected into the engine, hot air from the Diesel cylinder is driven through the fuel charge, thus cracking it into a gaseous mixture too rich to burn inside the injector plunger chamber. This hot fuel charge is then forced into the compression chamber when the piston reaches approximately top center. One advantage claimed for this fuel injection system is that fuel charges are more accurately metered especially at slow engine speeds.

L. Gardner and Sons, Ltd., of England, manufacture a truck Diesel which is widely used in that country and is enjoying increasing demand in Canada. The "Gardner" engine shows remarkable fuel and lubricating oil economy, and has a record of reliable operation when properly handled and supplied with a good grade of fuel and lubricating oil. This engine is normally hand-cranked and even when old, the starting is fairly easy. Its low compression ratio of only 13 to 1 contributes to the ease of starting. Data on the engines are as follows:

Engine Rating H.P.	No. of Cyl.	Bore and Stroke In.	Speed R.P.M.	Weight Lb.	Lb. per H.P.
51	3	4¼x6	1,700	....	....
68	4	4¼x6	1,700	....	....
85	5	4¼x6	1,700	....	....
102	6	4¼x6	1,700	1,500	14.7

The 102-hp. engine develops maximum torque of 348 ft.-lb. at 1,100 r.p.m., and at that speed has a guaranteed fuel rate of 0.363 lb. per b.hp. per hour (19,400 B.t.u. oil, and bare engine). At maximum speed of 1,700 r.p.m. and 102 hp., the fuel consumption is 0.395 lb. per b.hp. per hour.

Operating Costs of Diesel Trucks

A Diesel-engined gasoline delivery truck with a gross weight of 45,000 lb. is reported to make a 600-mile trip on 75 gal. of Diesel oil—an average of 8 miles per gal. of fuel oil, or 180 gross ton miles per gal. An operator with 2½ years' experience with Diesel trucks on mountainous hauling has published the following cost comparison between four 6-cylinder gasoline trucks and trailers, and four 6-cylinder Diesel powered trucks and trailers of equivalent capacity:

	Diesel	Gasoline
Total ton miles	762,203	765,960
Total fuel cost	$447.22	$2,833.89
Total lubricating oil cost	$242.78	$ 249.79
Total cost per ton mile (mills)	0.59	38.7
Lubricating oil cost per ton mile (mills)	0.32	0.326

Lubricating oil consumption is variable over wide ranges even on the identical engines. One reason for this inconsistency seems to be that engine temperatures are allowed to run too high with the result that the oil oxidizes rapidly. At high temperatures (above 150 deg. F.) and in the presence of air, lubricating oils tend to carbonize and emulsify and thereby lose their lubricating value.

An English operator of Diesel and of gasoline powered buses finds that the former engines are a little more costly to maintain, but the overall operating and fixed costs are about 83 per cent of the same costs for gas engines. That saving is effected in spite of an extra tax on the oil engine amounting to approximately $308 annually on a 56-seat bus. The Gardner bus engine (English) has completed a run of 95,000 miles before cylinder liners needed regrinding, and with no general overhaul during that mileage. One of the same manufacture was run for 55,000 miles before fuel sprayers were cleaned. Four trucks equipped with this engine have run a total of nearly 250,000 miles, at a total cost of repair parts approximating $50. A paper presented by Major W. H. Goddard to the Diesel Engine Users Association in England states that maximum cylinder wear can be expected to be 0.001 in. for 4,000 to 5,000 miles of bus service, and connecting rod and main bearings should last for 80,000 to 100,000 miles in that same service. Experience in England indicates a well-designed Diesel truck motor should have a life of ten years and at a cost of not more than ½ cent per mile for maintenance, repairs and renewals averaged for the entire period of usage.

High-Speed Diesel Engines for Industrial Power

Minor changes in engine supports, flywheel dimensions and enclosure, and in auxiliary equipment will permit the same Diesel engine to be used in powering trucks, tractors, industrial machinery, boats or locomotives. For that reason, the high-speed Diesel cannot be classified in a definite field of usage. However, when they are used in sta-

Table I — Data on Small-Powered, High-Speed Diesel Engine-Generator Units of 15 to 90 Kw. Rating

(Note: The cost of Engine-generator units includes comparable equipment)

Manufacturer		(A)				(B)		
Generator rating (kw. at 0.8 p.f.)	95	75	64	37	..	75	15
Engine rating on continuous load (b.h.p., sea level)		50	30	20	75	40	15
Speed, (r.p.m. at rated power)	900	820	900	850	1,200	1,200	1,200
Generator Efficiency, full load (per cent)	..	90.7	90.0	88.2	91.1	91.0	86.0
Generator Efficiency, ¾ load (per cent)	..	89.5	88.8	87.4	90.5	90.4	84.0
Generator Efficiency, ½ load (per cent)	..	86.9	86.0	85.2	88.0	87.9	79.0
Cost of generator with direct-connected exciter and exciter rheostat, f.o.b. factory		$1,038	$ 950	$ 799	$1,103	$ 878	$ 579
Shipping weight of generator, exciter and rheostat (lb.)		2,730	2,310	1,540	2,600	2,100	1,125
Engine—Number of cylinders	6	6	4	3	6	4	2
Bore and stroke, inches	5¾x8	5¼x8	5¾x8	5¼x8	5½x7	5½x7	5½x7
Two or four-stroke cycle	four	four	four	four	four	four	four
Type of injection		solid, pre-combustion			solid direct	solid direct	solid direct
Method of starting		gasoline engine					
Fuel for starting		gasoline					
Mfg. fuel pumps		own			Bosch		
Fuel consumption: lb./bhp./hr. at full load	0.44	0.47	0.45	0.48	0.44	0.44	0.45
at ¾ load	0.48	0.49	0.48	0.51	0.45	0.45	0.50
at ½ load	0.55	0.57	0.56	0.62	0.50	0.50	0.60
Shipping weight of entire engine-generating unit and auxiliaries with base and radiator, pounds	..	10,100	8,621	6,100	7,000	5,370	3,025
Cost of engine-generator set complete with starting equipment, radiator, base, and all engine auxiliary equipment; f.o.b. factory	..	$5,592	$3,924	$3,420	$5,903	$3,975	$2,575
Cost of engine and engine auxiliaries with starting equipment, radiator, base, and clutch for direct-drives; f.o.b. Portland, Ore.	$3,965	$3,613	$2,311	$1,928	....	....	....

tionary power service, the engine speed is usually governed for 750 to 1,200 r.p.m., which speeds are often somewhat below the maximum speed of the particular unit on continuous power duty. For example, an engine designed for industrial service rated 55 hp. at 1,200 r.p.m. would be operated, preferably, at 1,000 r.p.m. on driving an air compressor or similar load. The Diesels of high-rotative speeds are offered in sizes ranging from 10 to 150 hp. by the larger manufacturers, although the most popular engine sizes are from 40 to 100 hp.

Several manufacturers offer industrial power units for direct drives on electric generation in standard assemblies mounted on a common bed frame, and with a steel enclosure over the engine. All engine auxiliaries are factory installed in the unit, so that by piping the exhaust to a point where the fumes are not objectionable, and by filling the fuel tank, crank case and radiator, the unit is ready to run.

But if the power unit is to be installed in a building insured against loss by fire, the insurance rate will be greatly increased unless the installation is in accordance with the recommended practices of the National Board of Fire Underwriters. Among the requirements of the installation are that the fuel tanks shall be buried. That regulation, together with others governing the engine installation, may materially add to the cost of the power plant. If engine fumes, noise, and vibration will be objectionable in a building, considerable money must be invested in exhaust mufflers and piping, foundation insulation and sound-deadening material. In other words, the particular installation must be analyzed relative to the extra material costs occasioned by the use of a Diesel engine.

The prices of some Diesel engine generating units are appended to this report. It will be noted that each unit price includes comparable equipment. Operating cost data on the units are difficult to obtain, because most engines are on direct drives where the power output is not known. The cost of engine maintenance is not often segregated from that cost of the balance of the equipment: for example, the track, gear box, etc., on a tractor. In general, the fuel oil consumption on engines maintained in good condition equals or betters the engine manufacturer's guarantees. Lubricating oil consumption is sometimes very high even though a good grade of oil is used. By confining lubricating oil temperatures to 150 deg. F. or less through use of an auxiliary oil pump or oil cooler, reasonable performance will be gained. A 100-hp. engine running at an average of 75 per cent of maximum load may be expected to use one gallon of 56-cent lubricating oil for each 1,000 hp. hours of engine output. The tractor type Diesel of 50 hp. in stationary service ordinarily requires a change of crank case oil for every 30 to 120 hours of engine running time, with 100 hours the average for a unit in good condition.

In estimating lubricating oil consumption for a high-speed engine, the estimate should consider that the use will be practically the same regardless of the load.

A fair idea of the fuel and lubricating oil economy of a 25-kw., 900-r.p.m.

Table II — Data on Small-Powered, High-Speed Diesel Engine-Generator Units of 15 to 90 Kw. Rating

Note: The Cost of engine-generator units includes comparable equipment)

Manufacturer		(C)		(D)		(E)		(F)
Generator rating (kw. at 0.8 p.f.)	25	15	90	65	40	25	30
Engine rating on continuous load (b.h.p., sea level)					60	40	52
Speed (r.p.m. at rated power)	1,200	1,200	1,200	900	1,200	1,200	1,100
Generator Efficiency, full load (per cent)	89.1	86.0	92.4	91.7	90.8	89.1	90.8
Generator Efficiency, ¾ load (per cent)	87.7	84.0	91.6	90.7	90.1	87.7	90.1
Generator Efficiency, ½ load (per cent)	84.4	79.0	89.6	88.7	87.7	84.4	87.7
Cost of generator with direct-connected exciter and exciter rheostat, f.o.b. factory	$ 707	$ 579	$1,191	$1,233	$ 795	$ 690	$ 780
Shipping weight of generator, exciter and rheostat (lbs.)	1,710	1,125	2,900	3,050			
Engine—Number of cylinders	6	4	4	4	6	4	4
Bore and stroke, inches	3½x6	3½x6	7x8	7x8	4¼x6	4¼x6	4¾x6½
Two or four-stroke cycle	four	four	four	four	four	four	four
Type of injection	solid direct	solid direct	solid, pre-combustion		solid direct	solid direct	solid pre-combustion
Method of starting							hand cranking
Fuel for starting							Gasoline
Mfg. fuel pumps			No data		Bosch		Own
Fuel consumption (lb./bhp./hr. at full load)	0.49	0.49	0.43	0.42	0.50	0.50	0.49
(lb./bhp./hr. at ¾ load)	0.48	0.48	0.45	0.42	0.53	0.53	0.56
(lb./bhp./hr. at ½ load)	0.51	0.51	0.49	0.44	0.60	0.60	0.65
Shipping weight of entire engine-generating unit and auxiliaries with base and radiator (lb.)	3,700	2,800	9,300	9,330	5,650	4,900	5,170
Cost of engine-generator set complete with starting equipment, radiator, base, and all engine auxiliary equipment; f.o.b. factory	$3,600	$2,800	$6,853	$6,845	$3,450	$2,990	$3,400
Cost of engine and engine auxiliaries with starting equipment, radiator, base, and clutch for direct-drives; f.o.b. Portland, Ore.	..	..	..	..	..	..	$1,875

Diesel engine generating unit may be found in the following record:

OPERATING DATA

Average hourly load	16 kw. (25 b.h.p.)
Average generator (engine) capacity factor	64%
Time operated	1,126 hr.
Generation	18,070 kw.-hr.
Plant load factor (based on 6 mo.)	41%
Fuel oil used	2,010 gal.
Fuel oil cost	$0.06 per gal.
Lubricating oil used	18.25 gal.
Lubricating oil cost	$0.625 per gal.
Gasoline used in starting	18 gal.
Gasoline cost	$0.18 per gal.
Fuel used	0.823 lb. per kw.-hr.
Thermal economy	15,823 B.t.u./kw.-hr.
Lubricating oil	1,542 b.h.p. hr. per gal.
Breakdowns	None
Maintenance	None

Fuel used—Socony No. 4.
Lubricating oil used—Gargoyle DTE Ex. Hvy.

PRODUCTION COST

	Cost for 6 Mo.	Mills/ Kw.-hr.
Fuel	$120.60	6.67
Lubricating oil	11.81	0.65
Gasoline for starting	3.24	0.18
Attendance labor $7.50/mo.)	45.00	2.50
Maintenance	None	...
Total	$180.65	10.00

Engine Maintenance Expenses—Records of maintenance cost for high-speed Diesel engines are not sufficiently comprehensive to permit fair averages to be drawn at this writing. As in the case of lubricating oil consumption, engine repair costs are widely divergent, and do not appear to be dependent on the application of the engine nor on the care and attention devoted to the unit's operation. For example, consider the record of three 50-hp., tractor-type Diesels of the same manufacture installed in stationary service in the Pacific Northwest during 1934.

(1) This engine operated for approximately 1,000 hours from the time it was purchased in September, 1934, to January 31, 1935, during which time only $1.50 was spent for engine repairs. The engine is using over two quarts of lubricating oil as make-up for each eight-hour operation, so it is reasonable to expect that after the second 1,000 hours' operation (a total of 2,000 hours) it will be economical to give the engine a general overhaul and purchase new cylinder liners, pistons and piston rings, and possibly new connecting rod bearings.

(2) The owner of the second engine was given, free of charge, a complete set of pistons, piston rings and new crankshaft bearings, all installed, ostensibly because such parts were defective and required replacement within the first three months (500 hrs.) of engine operation. The plant operations were not delayed by these repairs because they were effected during the night when the plant was not running.

(3) This unit was installed in a gold mining operation for running a crusher and flotation mill machinery—either load, alternately. For that drive, the engine was put in service October 27, 1934, after it had powered a small sawmill for approximately 100 hours. By January 15, 1935, the plant had been shut down for major engine repairs a total of over ten days. The plant operator estimates the value of time lost on account of engine trouble to more than equal the first cost of the engine. Following is a log of the engine operation to and including April 7, 1935:

Month 1934	Days Operated	Hours of Engine Operation Per Day	Hours of Engine Operation Total for Month	Time Lost on Major Repairs to Engine (hr.)	Cost of Repair Parts (No Haulage or Labor Inc.)
October	3	16.0	48	0	....
November	29	16.0	464	0	....
December	23	16.0	368	*80	$ 78.00
January	27	20.0	380	†80	197.00
February	25	8.0	200	0	....
March	29	9.8	284	‡20	35.00
April	7	8.0	56	(A)	....

*Trouble caused by breaking of faulty timing gear, cracked cylinder liners, and failure of outboard bearing.

The above record is probably not typical, yet the engine is operating at less than rated load, two experienced Diesel engine mechanics are in attendance at the plant, the best grade of lubricating oil is used in accordance with the manufacturer's specifications on viscosity, etc., and the crank case oil is drained every 100 hours or less. No explanation for the failures of this engine is advanced, other than "it is a lemon."

In conclusion, it must be admitted that many of the present operating difficulties with the high-speed Diesel will be overcome when more operating experience is available. Research now being conducted by both the oil refiners and engine manufacturers will undoubtedly result in the development of fuel and lubricating oils which suit the requirements of each type of engine design. When that requirement is met, the result will be better fuel and lubricating oil economy and lower engine maintenance costs. If continuity of plant operation is an important economic factor, generous spare engine capacity must be provided in the form of additional engine units.

Repairing Water Wheel Runners by Arc Welding*

By R. F. MILLER
Portland General Electric Company

Published in the May, 1935 number Electrical West, page 18.

Discussion

H. E. Barnes, Puget Sound Power & Light Co., told of an experiment in repairing a 20-in. gate valve by a.c. welding in which cast iron was welded without pre-heating. A machine for this job was built in the company shop for about $150 and the total cost of the job was about $250. The manufacturer wanted $3,000 for new valves.

J. H. Siegfried, Pacific Power & Light Co., told of repairing a water wheel runner by arc welding at a cost of $142 when the manufacturer wanted $6,000 to replace the wheel.

General discussion settled around the efficacy of welding and consensus was that the welded parts showed little or no cavitation whereas the original metal continued to cavitate. It was also brought out that water wheel runners of modern design were less subject to cavitation than those of earlier design.

Repairing and Maintaining a 6000-Kw. Water- Driven Generator*

By J. H. SIEGFRIED
Pacific Power & Light Company

Published in April, 1935 Number of Electrical West, page 34.

Discussion

Pertinent to the very interesting description of repairing hydroelectric units in the field, the San Joaquin Light and Power Corp. was confronted with the necessity of truing up the generator shaft at the point of the lower guide bearing contact. Details on how an ingenious grinding device was developed to accomplish this without dismantling the unit should prove of interest to every operator. This paper by Mr. F. R. Harp, Supt. of the Kerckhoff Power House of the San Joaquin Light and Power Corp. will appear in an early issue of Electrical West, its contents being too detailed to be included as a part of this discussion.

†Engine failed completely and was sent to Portland for general overhaul. New cylinder liners, pistons, rings, main and connecting rod bearings, installed, together with smaller parts.

‡Outboard bearing failed again. New valve and valve seat installed.

(A) Early in April, 1935, the engine showed signs of trouble by reason of decreased power and overheating. The owner contemplates buying a new engine.

Methods for Checking the Loading of Distribution Transformers*

By M. T. CRAWFORD
Puget Sound Power & Light Co.

THE total distribution transformer capacity installed on light and power distribution systems is apt to be several times the actual peak load at the substations. Among other things, this is due to the diversity factor between individual transformer installations on industrial, commercial and residential services. During recent years many customers have had to discontinue use of part of their equipment or move out to cheaper locations, leaving idle transformer capacity at some points and requiring additional capacity at others.

In order to avoid unnecessary purchasing of new transformers for shifting loads, as well as to avoid burn-outs from overloads, some means of getting prompt information on the loading of transformers would save a considerable sum of money annually. The methods used by ten typical companies in the region were investigated and the information is assembled here for discussion.

Several manufacturing companies have placed on the market a device which may be permanently attached to line transformers, giving visual indication of the maximum loading condition to which the transformer has been subjected since the last time the setting of the device was adjusted. The term "permanent indicating device" is used to describe this equipment as distinct from the portable indicating or graphic metering equipment which is ordinarily used for obtaining spot readings or short time curves of load conditions.

Company A—Permanent indicating devices are attached to a certain percentage of the transformers of 20 kva. and up. These devices are moved periodically from one group of transformers to another, so that all of the larger units have had the benefit of their installation for a reasonable time about once every three years.

All sizes of transformers are examined once a year, usually in the fall, as to general condition, temperature and oil. Where there are indications of overloading, portable graphic instruments are installed and the actual load obtained.

Ratio of installed transformer capacity to feeder peak load varies from 1.5 to 2.5. A general rule permits loading individual units to 160 per cent of rated capacity during winter months, but this frequently results in low voltage complaints and cannot always be followed.

Company B—Permanent indicating devices are not used except in specific cases. Periodic tests are made on winter evenings with a split-coil current transformer and indicating ammeter. Readings are taken to show the load balance on transformer coils as well as current feeding in each direction from the transformer. Where abnormal loads are found the indicating test is followed up with the graphic test.

Data available are only on a few city feeders where the installed transformer capacity varied from 1.6 to .94 of the feeder peak load.

Company C—The larger transformers supplying business center commercial lighting are checked once each winter with split-coil current transformers and indicating instruments during the peak hour. This is followed by a temporary installation of a permanent indicating device for one week where an overload is found to exist. Other lighting and power transformer installations in industrial, residential and rural area are not checked for load conditions except by observation of the connected load by the inspector when adding new services.

Company D—Permanent indicating devices are not installed. Periodic tests with graphic or indicating instruments are not regularly made. Where information is received indicating an overload a graphic instrument is installed for a time. There are no large cities on this system and it is relatively easy for the operating men to keep in close touch with load conditions.

Company E—No permanent indicating devices are used. A complete check with indicating instruments was made of the loading on all distribution transformers several years ago following which a record system has been used to keep this information up to date.

For this record system a specially printed page and loose leaf system is employed on which each customer is posted with the details of connected load. One page is used for the customers normally supplied from each transformer and a running record of the total connected load is kept in this manner. A percentage of this connected load which is active is estimated from the information obtained at the time of the complete check of connected load and demand made several years ago.

Commercial power customers have their connected load rechecked once a year. Information on other changes comes from line orders and requests for installation or removal of larger devices.

Company F—Permanent indicating devices are used on certain transformers, where an annual inspection of the maps and records indicates that the load will probably exceed the rated capacity. This procedure of making periodic tests with graphic and indicating instruments has been largely abandoned in favor of permanently installed indicating devices. Approximately the same practice is observed in commercial, industrial and rural areas.

The ratio of installed transformer capacity to actual peak load on certain city feeders is estimated to be about 1.7.

Company G—Made an exhaustive study of transformer loads in a typical district several years ago from which it was decided that permanently installed indicating devices gave very reliable results. These devices are being installed, at least during the winter months, in preference to taking spot readings with indicating instruments.

In this particular area of survey the ratio of installed transformer capacity to peak load on the entire substation was found to be about 2.0.

Company H—Once each year periodic tests are made during the winter months in business sections of towns and cities with split coil current trans-

†T. A. Purton, Idaho Power Co., Chairman. M. T. Crawford, Puget Sound Power & Light Co., Vice-chairman.

British Columbia Electric Railway Co., P. C. Gill; Eastern Oregon Light & Power Co., O. D. Lanning; Grays Harbor Railway & Light Co., F. J. Robbins; Idaho Power Co., H. M. Jones; Montana Power Co., A. C. Pratt; Mountain States Power Co., Walter Smith; Oregon State College, F. O. McMillan; Pacific Power & Light Co., R. J. Davidson, H. H. Schoolfield; Portland General Electric Co., H. R. Wakeman; Utah Power & Light Co., D. L. Brundage; The Washington Water Power Co., L. R. Gamble; West Coast Power Co., C. P. Eliot.

*Report of the Production and Generation Committee, Engineering and Operation Section.

former and indicating ammeter. Where information is at hand indicating the necessity for it, graphic ammeter charts are taken on individual transformers in residential, industrial and rural sections but no regular periodic tests are made.

Company I—This company made a comprehensive series of load tests with graphic instruments and a totalizing circuit, from which a dependable set of curves were made up showing the maximum demand of a large number of consumers having ranges and waterheaters, and of another group having lighting and small appliances only. From these curves a close estimate is made of the maximum demand on a transformer when the number of lighting customers and of range and water heater customers connected to the transformer is known.

The test curves also gave information as to the duration of the peak and from this it was concluded that an overload of 150 per cent was permissible on residential loads during the winter maximum demand period. By keeping in touch with the connected load of customers served from each transformer, this company has been able to bring the ratio of installed transformer capacity to the peak load on individual feeders in certain city areas up to values between 1.07 and 1.24. These particular feeders serve areas with a high saturation of electric range and water heater load and considerable care was used in supervising the situation.

Transformers operating under heavy load conditions are inspected every year or two to determine condition of oil, etc. Load tests are made only when it is thought desirable to find whether or not the curves are indicative of the actual load conditions.

Company J—Permanent indicating devices are used to a very limited extent, principally on larger subway transformers. The practice has consisted of making an annual spot check test with indicating ammeter and split coil current transformer of the winter maximum demand on transformers in commercial and apartment house areas. On underground transformers in the business center graphic ammeter tests were made each fall. On industrial power transformers the check of load for purposes of establishing billing demand was relied on to indicate overload or underload, and indicating ammeter tests were then made if necessary, to determine the need of changes in capacity of transformers.

On city residential distribution this company banks together all the transformers on a primary feeder. With a large number of transformers banked together, it is very rare for a transformer to be burned out from overload, so long as low voltage complaints are immediately followed up by spot readings and proper attention to the transformers in the vicinity. For this reason no periodic tests are made. On suburban and rural lines the local serviceman's knowledge of load conditions has been relied on, and no regular periodic tests are considered necessary.

Information available on a few typical feeders supplying city residential areas showed a ratio of installed transformer capacity to peak load varying from 1.71 to 2.09, with a few heavily loaded feeders from .95 to 1.02.

Discussion of Trend in Practice

During recent years the shifting of loads and decreased use by customers has resulted in underloaded transformers at certain locations, while new equipment had to be installed at other points. In many cases loads have been reduced, ranges and water heaters disconnected and moved by contractors or customers without the company's knowledge. This made it difficult to ascertain where underloaded equipment was available and also resulted in overloading transformers at other points without the company's knowledge.

The necessity for economy in the purchasing of new transformers has resulted in a trend toward some means of keeping closer supervision on the loading than can be afforded by the usual methods of installing permanent indicating devices on a few large units and making periodic spot checks of load at certain locations. Company E has set up a system which provides a running record, and several other companies have taken more than the usual care in making tests and supervising loads, with the result that a higher loading factor on equipment has been attained.

A new scheme was suggested last year by Ray Rader of the Puget Sound Power & Light Co., and it has been put into trial use in a limited area with very promising results. A record is made from field inspection and maps, of the customers in the normal service area of each individual transformer. The monthly consumption in kw.-hr. of the customers assigned to each transformer is then totalized and recorded, using the regular meter readers book for this purpose. A conversion factor is established for each class of distribution by comparing actual load tests with monthly kw.-hr. consumption, from which a fairly accurate estimate can be made of the peak load. After this system has been once set up it is purely a clerical matter to keep a running record of the actual changes in load, and obtain readily comparative figures from month to month.

One advantage of this scheme is that changes in load made without the company's knowledge are known within a short time. An occasional spot test of load during the peak load time will furnish a check on the accuracy of the conversion factor. It is estimated that after the system is once installed one engineering clerk can keep up the record for about 200,000 kw. of line transformer capacity. The results during the trial period so far have been principally of value in giving information on a considerable number of lightly loaded transformers. These have been removed and used elsewhere, greatly reducing the necessary number of new transformer purchases.

Asphalt Emulsion Treatment Prevents Radio Interference

By F. O. McMILLAN
Research Professor of Electrical Engineering, Oregon State College

Published in the January, 1935 number of Electrical West, page 16.

Discussion

G. L. Wilder, Locke Insulator Corp.—Tests of this company on coatings for pin type insulators to eliminate radio interference have shown that conducting coatings were a failure. Non-conducting materials have shown up better, but have not been entirely satisfactory because they do not last. Of all the materials tried, Professor McMillan's emulsion has proven to be the best. This problem has been more acute in the West than in the East where radio listeners are generally closer to the stations they habitually tune in on.

A. Vilstrup, British Columbia Electric Railway Co.—The ultimate cure of radio interference from high tension lines lies in the construction of more powerful broadcasting stations plus the broadcasting of better programs by local stations. As it is, people now want to operate their sets on long distance

below the natural noise level because they want to receive the programs offered by the larger stations at a distance in preference to local small station programs.

Ellis Van Atta, Pacific Power & Light Co., cited the experiences of his company with the treating of a high tension line in and near Yakima. (See written discussion printed with this paper in ELECTRICAL WEST January 1935.) He stated that the treatment effected a reduction in noise and made reception possible. He emphasized the fact that the treatment also brought to light other sources of interference in other power company equipment which was not traceable to this equipment prior to the treatment of the insulators.

Prof. F. O. McMillan, Oregon State College—Summing up the discussion and answering questions, Professor McMillan stated that the ratio of signal strength to the interference level has an effect on the kind of reception, and if the broadcasting stations in the Northwest had more power there would be less interference from high tension lines.

If there is interference from other sources, it won't do any good to treat the insulators.

The emulsion can be used on any voltage line that is causing any interference. Some have used it successfully on voltages as low as 23,000.

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Written Discussion on Direct Current Power Transmission

By G. L. WILDER
Locke Insulator Corp.

THE essential features of this new system of power transmission by direct current has been explained. It would be presumptuous to forecast just what future this important new development has to offer, but everyone is much interested in a number of the advantages to be gained therefrom.

Every operating man will agree that the lightning problem in connection with the operation of long high-voltage transmission lines is serious. The discussion of lightning proof lines has been thoroughly gone into at many meetings similar to this. From an operating standpoint a lightning proof line is very desirable but its cost is often a serious economic problem.

You are all familiar with the present practices to protect transmission lines such as low resistance tower footings, counterpoise and the use of overhead ground wires. Recently there has been much interest in the use of expulsion protective gaps. These devices placed on the line shunt the insulators and offer a path from line to ground through which the impulse current passes, but the 60-cycle current is immediately snapped out by means of the expulsive action of the gap.

Now in the case of direct current transmission it appears that there is a very unusual but desirable characteristic of an insulator being short circuited by means of an impulse flashover with no attendant 60-cycle following current. In other words, the insulator itself might be classified as a sort of lightning arrestor which would enable the line to be cleared of any high voltage transients by a simple flashover. Perhaps we may expect to consider the d.c. transmission line as a true lightning proof line.

From a practical standpoint d. c. transmission indicates the lessening of construction costs because shorter insulator strings may be used, clearances may possibly be reduced and simpler designs of hardware used as corona would seem to be largely eliminated.

The aforementioned expulsion gaps, grading rings and other present forms of protective devices may be lessened or done away with altogether. Lighter but equally strong construction can be used to reduce the loading on tower structures. When short circuits do occur, the nature of the arc is entirely different from that now experienced. There will not be the destructive arcing and burning of insulators and hardware with the danger of parting conductors. The reduction of the line voltage to a very low value prevents this. As a result, while there doubtless will be line disturbances, they will not be of the violent nature now experienced resulting in the loss of load and lengthy interruptions.

Actual experience may produce new and unexpected operating problems, possibly such as electrolysis and the like, but the advantages as demonstrated by present experiments seem to outweigh the disadvantages we now experience. It would appear that aside from being extremely flexible in operation it offers safety features of a desirable nature.

Some comments by W. H. Norris, Jr., of the Locke Insulator Corp., are appended.

"With the system just described, power can be transmitted in one direction only. The rectifier uses a two-element tube and hence cannot reverse. Power, therefore, can flow only from the sending end. This will be an advantage in some cases, as it may be undesirable that power should be transmitted in both directions. Where it is desired to do this, however, the substitution of Thyratrons for the Phanotrons in the rectifier will permit such operation. The control, however, of the direction of flow of power can remain in the hands of the operators. By the addition of the proper control equipment, the amount of power to be transmitted can also be controlled, thus this system places in the hands of the operator full control of the direction of flow, and of the amount of power. This can not readily be accomplished with alternating current, if, indeed, it is possible at all.

"Since the transmission of power is solely by direct current, wattless kva. cannot be passed from one system to another. This characteristic, therefore, offers a method of solving the problem of probable division of wattless kva. between two systems.

"The rectifier of the constant current d.c. system can be made to operate at unity power factor, and if desired, at slightly leading power factor. Generators feeding such an equipment directly could therefore operate at their maximum kw. output and consequently at higher efficiency. The leading power factor characteristic might also be used to reduce the amount of excitation. Economies in this direction have not been fully explored, but would appear to be worthy of consideration. At the receiving end, the monocyclic network can be designed with the requisite proportions of capacity and reactance to operate successfully into any required system power factor.

"The short circuit characteristic has an interesting effect on insulator flashovers. It is to be expected that the direct current line will be subject to much the same lightning potentials as the alternating current one, and insulator flashovers are therefore to be expected. With the constant current system, the impulse voltage will spill over the insulators to ground and will result in establishing a short circuit. Since, however, the short circuit current is limited to but a small percentage of the normal current, and since the voltage momentarily falls, because of the short, there is insufficient voltage and current to maintain the dynamic arc over the insulator. We would expect nothing more than the relief of the induced potential and that the line would continue the operation without interruption. Tests indicate that it is impossible to maintain an arc with 15,000 volts, and 200 amperes over a single insulator. It would seem, therefore, that such a line as we are suggesting would be practically lightning-proof, and that savings could be made in the insulators required. A.c. lines at present are insulated largely because of lightning voltages and a large factor of safety is

employed. This factor of safety could be very materially reduced with a constant d.c. system.

"There appear to be rather definite limits to the effective range of a.c. transmission, due largely to the reactance of the line as it affects regulation and stability. This is particularly true in the case of long lines with large blocks of power and consequently high voltages. With d.c. as the transmitting medium, the length of line is limited only by the resistance and by losses which can be sustained economically, because of that resistance. A d. c. line resolves itself largely into the determination of the most economical combination of current and resistance for the given conditions.

"The absence of reactance opens up a field for transmission which is not possible with a. c. Reference is made to the use of underground cables. With a. c. the distance for which cable can be used is very circumscribed, but with d.c. resistance is the only factor to be considered. This, of course, brings up the question as to the voltages which can be used with cables. Here again, we lack both experimental and operating data, as to the ratio of d. c. to a. c. voltages for a given insulation. Authorities can be found for factors ranging from 1.4 to 12. For the most part, these ratios, particularly the higher ones, seem to be based upon the extension of rather insufficient data obtained from low voltage samples, although Thury has been operating a cable at a fairly high ratio and with entire success. A conservative figure for present purposes would appear to be about 3.5 as a ratio between d. c. and the equivalent R. M. S. a. c. voltage. Bearing in mind that the midpoint of the constant current system is grounded, and therefore, that the voltage stress to ground is one-half of line to line voltage, and applying this factor, we find that the transmission voltage can be brought to a point where the capacity of existing cables can be very materially increased. On the basis of the same assumptions, new cables for d. c. transmission will require decidedly less insulation, and should therefore be much cheaper than cables for a. c. service. D. c. offers an added advantage in cable operation in that the ionization of voids is eliminated. The constant current system offers a further advantage in that under service conditions, the cable operates at uniform temperature. This avoids expansion and contraction with consequent loosening of the lead sheath and the difficulties attendant upon this condition.

"The constant current d. c. system therefore opens very attractive possibilities in the realm of high voltage, long distance, underground transmission. Such a line would be entirely free from lightning, wind, and sleet, and hence should insure greater continuity of service. Such cables can readily be laid underground in reasonable country with modern equipment, and for high voltage and long distance work, may offer a cheaper method than the conventional overhead construction."

Discussion

Voltage Regulation on Rural Lines by Means of Transformer Taps

T. A. Purton, Idaho Power Co., chairman, Transmission and Distribution Committee, introduced for round table discussion the question of whether or not the companies desired voltage taps on their distribution transformers. This question was raised appropos of the fact that manufacturers were attempting to produce a cheaper transformer of 1 to 5 k.v.a. capacity for rural use.

Consensus of those discussing this subject was that the use of voltage taps to adjust poor regulation was not generally good practice, since it was apt to create too high a voltage on the customer's equipment at all times off the peak. It was agreed, however, that one 5 per cent tap would be useful and, in fact, desirable on transformers used in rural service.

Utilization Committee† + + +

Electric House Heating*

By JOHN BANKUS
Portland General Electric Co.

THERE is no question in the mind of the engineer that it is entirely feasible from an engineering standpoint to design and install an electric house heating installation which will give 100 per cent satisfaction on the part of the customer. The only question which has ever been raised by the engineer is whether electric heating can be made sufficiently attractive from a cost standpoint to make it competitive with other means of heating.

In this memorandum, therefore, particular attention has been given to the competitive angle of the situation. For the purposes of this discussion, I have raised eight specific questions, all of which I believe are pertinent to the subject of electric house heating. I shall first state these eight questions and then proceed to discuss each in turn.

1. As a general proposition, can electricity be economically used for house heating?
2. What do the data obtained from the electric house heating experiments in Tacoma, Province of Quebec, and Minodoka Project in Idaho show?
3. How may electricity be used for house heating?
4. What types of heating installations and what kinds of fuel are at present most commonly used in the Northwest for house heating?
5. What factors determine the amount of heat that is required?
6. What factors determine the cost of fuels?
7. How does the cost of different methods of heating compare when applied to a typical six-room house?
8. What advantages has auxiliary electric heating and to what applications is it particularly adapted?

Can Electricity Be Economically Used for House Heating?

It is generally recognized that there is a large amount of undeveloped water power in the Northwest and the opinion seems to be widely held that all hydroelectric energy is cheap. These opinions have caused many people to advocate the development of our water resources on a scale which will permit the general use of electricity for house heating.

The report of the Divisional Com-

†Paul P. Ashworth, Utah Power & Light Co., Chairman, Walter Brenton, Portland General Electric Co., Vice-chairman, and Chairman, Utilization Devices Subcommittee. S. B. Clark, Northwestern Electric Co., Chairman, Wiring Subcommittee, F. H. Murphy, Portland General Electric Co., Chairman, Illumination Subcommittee. L. D. Snow, Chairman, Meter Subcommittee. British Columbia Electric Railway Co.: E. E. Walker; The California Oregon Power Co.: R. S. Daniels; Eastern Oregon Light & Power Co.: B. F. Lentz; Idaho Power Co.: L. W. Brainard. Orland C. Mayer; Montana Power Co.: D. J. McGonigle; Northwestern Electric Co.: E. F. Pearson; Pacific Power & Light Co.: Corbett McLean; Portland General Electric Co.; A. H. Greisser: The Washington Water Power Co.; C. F. Norberg.

*A report of Utilization Committee, Engineering and Operation Section.

mittee on Water Resources of the Pacific Northwest Regional Planning Conference, which was held in Seattle in December, 1934, gives the following figures for potential and developed water power in the four Pacific Northwest states:

POTENTIAL WATER POWER BY STATES

	Potential Water Power in Kilowatts 80% Efficiency	
	50% of Time	90% of Time
Washington	10,225,600	7,481,410
Oregon	5,374,920	3,744,080
Idaho	3,032,140	2,284,840
Montana	3,156,000	2,175,000
	21,788,660	15,685,330

PRESENT INSTALLED GENERATING CAPACITY

	Hydro Kw.	Fuel Kw.	Total Kw.
Washington ..	724,300	194,500	918,800
Oregon	179,500	156,600	336,100
Idaho	224,500	2,100	226,600
Montana	299,900	10,700	310,600
	1,428,200	363,900	1,792,000

These figures show that only a very small part of the potential water power has so far been developed. Let us now consider for a moment the potential water power which is available 90 per cent of the time. For the four states this totals 15,685,000 kw. when measured at the plants. If we assume a loss of 30 per cent between the plant and the customer then the total capacity available for customers would be 10,980,000 kw.

On the basis of the 1930 population as shown below and considering four persons per family, there would be in the four states 874,955 families.

	Population in 1930	Number of Families Based on Four Persons per Family
Washington	1,563,396	390,849
Oregon	953,786	238,447
Idaho	445,032	111,258
Montana	537,606	134,401
	3,499,820	874,955

If we assume that the number of homes is the same as the number of families, then the average kw. per home is 12.5 kw. This figure would be increased by whatever diversity is found to exist in the heating loads. Undoubtedly there will be some diversity but it will probably not be very large, as 12.5 kw. would probably be ample for heating an average house if heat storage were used but would not be ample during severe cold spells if heating were done by direct radiation. On the basis of a 30 per cent loss, the plant capacity corresponding to a customer load of 12.5 kw. would be approximately 18 kw.

If we assume further that the average plant construction cost for power which is available 90 per cent of the time amounts to only $200 per kw. (which is believed to be much too low), then it would follow that the investment in the generating plant alone for heating an average home would be $3,600. If we assume public development without taxes and include only 7 per cent to take care of operation and maintenance plus interest, depreciation and amortization, then the average yearly cost of the generating plant per customer would be $252. To obtain the total cost we must add to the generating cost the cost of transmission and distribution.

The house heating committee of the Northwest Regional Planning Conference estimated that the distribution cost for an ideal urban set-up with 3,200 customers per square mile would be somewhere between 6 and 7 mills per kw.-hr. To this figure should be added another mill to cover the cost of transmission. This would bring the sum of the transmission and distribution cost to a figure between 7 and 8 mills. Such a figure would, however, be far too low if used as a general average for urban and rural territory.

An average house for the territory considered would require at least 35,000 kw.-hr. per year. At even the low figure of 7 mills per kw.-hr. this would bring the transmission and distribution cost to $245 per year. Adding this to the $252 plant cost would give a total figure of $497 or approximately $500 per customer per year.

These figures show clearly that as a general proposition electricity cannot be economically used for house heating. Moreover, such a program would be objectionable from the standpoint of conservation of natural resources. If electricity were adopted generally for house heating, it would utilize the total potential hydro energy for heating existing homes. Mechanical power would, therefore have to be obtained from fuel plants. While there would be no objection to generating electricity from fuel when this can be done more economically than by hydro, nevertheless it would not be reasonable or economical to utilize hydro energy for heating and at the same time depend on fuel for mechanical power. This follows from the fact that the energy of fuels can be converted into heat with a much higher overall efficiency than can be obtained when transforming the energy into mechanical power.

What Do the Data Obtained From the Electric House Heating Experiments in Tacoma, Province of Quebec, and Minodoka Project in Idaho Show?

Considerable data on electric house heating have been obtained from the experiments conducted in this country and Canada. The more important of these experiments are those which were conducted in Tacoma; on the Minodoka Project in Idaho; and in the Province of Quebec, Canada. It is believed that the data obtained from the Minodoka experiments are generally applicable to the territory which lies east of the Cascade Mountains, while the data obtained from the experiments in Tacoma are applicable to conditions existing west of the Cascades.

Since the relatively mild climate of western Oregon and western Washington is most favorable to the application of electric heat, particular attention has here been given to the data which have been made available through the electric house heating experiments in Tacoma.

Old Electric Heating Rate in Tacoma

In 1914, the City of Tacoma established an electric house heating rate of one-half cent per kw.-hr. with a $9.00 per kw. minimum charge per year. This rate was established in order to promote a use for energy which would otherwise go over the dam.

The electric heating situation in Tacoma was investigated by E. A. Loew, professor of electrical engineering at the University of Washington. Professor Loew has treated the subject in a very authoritative manner and his findings are covered in the University of Washington Experiment Station Bulletins Nos. 15 and 20 which were issued in December, 1921, and November, 1923, respectively.

Professor Loew found that at the close of the year 1918 only 378 customers had taken advantage of the half-cent rate. However, immediately following the war there was a coal strike which resulted in a rapid rise in the price of both wood and coal and stimulated an interest in electric heating. The result was that by the end of 1919, 547 customers were using electric heat either wholly or in part. In 1920, this number increased to 925, and by the end of 1921 it reached 1,978, of which 1,017 were full-year users.

As previously mentioned, the original intention in Tacoma was to supply the heating load from the surplus power developed at the Nisqually plant. When this surplus power had been exhausted the city served notice that it would not take on any new heating business at the original rate after January 1, 1922. The result was that by the end of 1924 the total number of heating customers decreased to 1,888, of which only 941 were full-year users. By the end of 1925 the total had reduced to 1,779 and by the end of 1934 the total number on the old rate amounted to only about 400 customers.

Revised Electric Heating Rate in Tacoma

However, it should be noted that by special application electric heaters can at present be operated on the Tacoma system in combination with the lighting

and cooking rate under the following conditions:

1. "That the one-cent per kw.-hr. rate shall apply to 800 kw.-hr. for each single residence, flat or apartment, after which the price shall be one-half cent per kw.-hr."
2. "Where more than two apartments are measured on the one meter, the one-cent rate shall apply for the following number of kw.-hr."

"For each of the first ten apartments, 700 kw.-hr. each."

"For the next twenty apartments, 600 kw.-hr. each."

"For the remaining apartments, 500 kw.-hr. each after which the price shall be one-half cent per kw.-hr."

3. "Where the heating loads are greater than 10 kw. for each residence, flat or apartment, 50 kw.-hr. shall be added to the one-cent part of the rate for each additional kw. of connected load."

I have no official data regarding the exact number of customers who have taken advantage of the new rate for heating. However, it does not appear to have been sufficiently attractive to promote much house heating business. I have dealt at some length on the heating rates of Tacoma merely to point out that such rates, which are admittedly very low, will not promote much

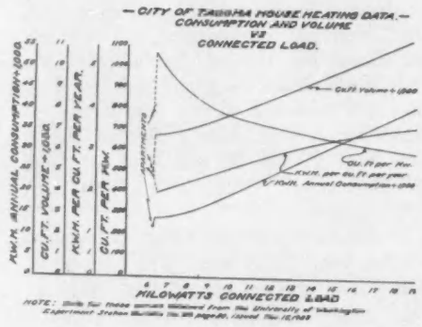


Fig. 1—House heating data for electrical installations in Tacoma

house heating load unless the rates are actually or very nearly competitive with other means of heating.

Consumption for House Heating in Tacoma, 1921

Professor Loew calls attention to the fact that by far the larger part of the total number of electric heating customers in Tacoma used electrical energy merely as an auxiliary to the ordinary heating system. However, by going through the records very carefully, he was able to pick out some 275 customers who heated their homes either entirely or very largely by electrical energy throughout the year.

By carefully analyzing the available data for these 275 customers, Professor Loew was able to establish fairly consistent relations between annual consumption in kw.-hr., volume to be heated in cu. ft. and connected loads in kw. These relations are shown by Table I and by the curves in Fig. I. The corresponding percentage distribution by months of the yearly consumption is shown by Table II.

The electric house heating data available for the Minodoka Project in Idaho and the Province of Quebec indicate a much heavier consumption than that shown in Table I for Tacoma. This is of course due to the lower winter temperatures which prevail in Idaho and Quebec. The energy for heating on the Minodoka Project is sold at a very low rate. However, the heating load does not pay its proportional share of the development cost.

Table I — Kw.-hr. Consumptions by Months for Residences and Apartments, City of Tacoma

	Different Size Residences					Apts*	Res. with Elec. Furnaces**
No. Consumers....	50	29	40	19	12	51	18
Vol. Range, cu.ft.	4,500-6,300	6,300-8,100	8,100-9,900	9,900-11,700	11,700-15,300		
Av. Vol., cu.ft....	5,520	7,310	9,840	10,850	13,400	5,000	9,660
Consumption (Kw.-hr.)							
January	2,370	2,980	3,994	4,590	6,440	2,210	5,250
February	2,290	2,680	3,557	3,940	5,240	1,788	4,600
March	2,285	2,495	3,510	4,120	5,075	1,527	4,850
April	1,700	1,910	2,820	3,170	4,085	1,140	3,850
May	1,490	1,560	2,270	2,890	3,670	963	3,067
June	630	742	861	1,215	1,530	472	1,055
July	423	350	455	720	666	254	500
August	251	262	303	536	452	145	270
September	494	533	562	866	845	322	573
October	987	1,020	1,305	1,775	1,790	602	1,742
November	1,535	1,655	2,170	2,650	2,890	1,035	2,809
December	2,225	2,340	3,390	4,170	4,400	1,437	4,545
Total.....	16,680	18,527	25,197	30,642	37,083	11,900	33,209
Av. Con. Load (Kw.)	8.45	10.1	12.2	13.3	16.9	6.3	14.6
Av. Annual Load Factor (%).....	22.6	20.9	23.6	26.3	25	21.6	21

*Full year apartment customers
**Full year residence consumers having electric furnaces.

Building Construction and Heat Insulation

The type of construction used in Tacoma is described as follows by Professor Loew on page 43 of Bulletin No. 20:

"Owing to the mild climate, houses in this section are not built as tight as is customary where winters are more severe. Frame structures are the rule. The walls and partitions are built on 2 x 4 in. uprights or studdings, placed on 18 in. centers, lathed and plastered on the inside. On the outside next to the studding is the usual rough sheeting covered with a thin building paper, over which the siding or shingles are nailed. Floors are built with a rough flooring over the joints, then building paper and over that the usual fir or hardwood flooring. Ceilings are of course lathed and plastered. Unfinished attics frequently are without floors, and consequently there is a good deal of radiation through the ceilings of the upper rooms. Back plastering, double doors and double windows for winter use are unknown in this section, and the use of heavy building paper or felt insulation is rare."

This description no doubt portrays the type of construction which is used very generally throughout the Northwest. If the houses were better insu-

Table II — Percentage Distribution by Months of Yearly Consumption for Residences and Apartments, City of Tacoma

	Different Size Residences					Apts*	Res. with Elec. Furnaces**
No. Consumers....	50	29	40	19	12	51	18
Vol. Range, cu.ft.	4,500-6,300	6,300-8,100	8,100-9,900	9,900-11,700	11,700-15,300		
Av. Vol., cu.ft....	5,520	7,310	9,840	10,850	13,400	5,000	9,660
Consumption (per cent of total for year):							
January	14.2	16.1	15.9	15.0	17.3	18.6	15.8
February	13.7	14.5	14.1	12.9	14.1	15.0	13.9
March	13.7	13.5	13.9	13.4	13.7	12.8	14.6
April	10.2	10.3	11.2	10.3	11.0	9.6	11.6
May	9.0	8.4	9.0	9.5	9.9	8.1	9.2
June	3.7	4.0	3.4	4.0	4.1	4.0	3.2
July	2.5	1.9	1.8	2.3	1.8	2.1	1.5
August	1.5	1.4	1.2	1.8	1.2	1.2	0.9
September	3.0	2.9	2.2	2.8	2.3	2.7	1.8
October	5.9	5.5	5.2	5.8	4.9	5.1	5.3
November	9.2	8.9	8.6	8.6	7.8	8.7	8.5
December	13.4	12.6	13.5	13.6	11.9	12.1	13.7

*Full year apartment customers.
**Full year residence consumers having electric furnaces.

Table III — Temperature Range, Portland and Tacoma (deg. F.)

Month	Tacoma Av. Outdoor Temp.	Portland Temperatures (61 Years of Record) Max. Monthly Mean	Av. Monthly Mean	Min. Monthly Mean	Min. Hourly for Month	Mean Daily for Abs. Min.	Abs. Max. for Month
January ..	40.3	46.9	39.4	28.0	—2	6	64
February .	42.8	49.4	42.3	32.0	7	13	68
March ...	44.6	55.2	47.4	40.5	20	23	83
April	47.2	60.2	52.1	45.6	28	40	93
May	53.6	62.7	57.4	51.1	32	46	99
June	60.0	67.1	61.4	57.6	39	49	101
July	61.4	72.3	67.3	62.8	43	56	104
August ...	62.2	71.2	67.0	61.5	43	56	102
September.	56.3	67.4	61.7	57.4	35	46	97
October ..	52.3	59.1	54.6	49.5	30	38	86
November.	45.6	52.5	46.4	38.6	11	17	73
December .	38.4	48.4	41.3	31.5	3	10	65

lated, it is certain that a very substantial reduction could be made in the energy required for heating. This would of course be true whether the houses are heated electrically or by the ordinary fuels, but it would be of much more importance in the case of electric heating because the heating medium is more expensive.

How May Electricity Be Used for House Heating?

There are four general methods by which electricity may be utilized for house heating. These will be described very briefly.

(a) *Direct Heating Method*—This is the method which has been most commonly used. It consists of unit space heaters which may be portable or if desired may be built into the wall and may be arranged for either manual or automatic control.

Their advantage lies in their high efficiency and comparatively low first cost.

Their disadvantage is that they require a high demand with a comparatively low annual load factor and small diversity factor. This high demand, coupled with the low annual load factor, low diversity and high development cost, make the electric heating problem very difficult. To compete with other methods of heating, the cost per kw.-hr. must be very low and the distribution cost cannot be sufficiently low when a high demand is combined with a low annual load factor and a low diversity factor.

(b) *The Heat Storage Method*—The heat storage method permits the use of off-peak power by storing the heat in water or some solid material such as brick, stone or metal. The advantage of this method is that it tends to reduce the demand on peak and increases the load factor. However, it must realized that if any general scheme of electric heating were used, the heating load would be so great in comparison with other loads that it alone would largely determine both the peak demands and load factor. We are sometimes told that this could be overcome by creating a summer irrigation load to offset the winter heating load. Such balancing of summer and winter loads would improve the load factor on the generating plants but would not reduce distribution costs unless the heating and irrigation loads use the same distribution system.

Disadvantages of the heat storage method are that it is less efficient than direct radiation and increases the customer's installation expense.

(c) *Reversed Refrigeration Cycle or Heat Pump Method*—This method uses a motor driven compressor in connection with suitable heat exchangers for extracting heat from the outside air. Experiments which have been made with this type of equipment indicate that for weather conditions such as normally prevail west of the Cascades a heat pick-up ratio of 3 to 1 or 4 to 1 should be possible.

From the standpoint of energy consumption and demand on the distribution system this is by far the most desirable method of employing electric energy for heating. However, there are some practical objections which have not as yet been overcome and present indications are that the cost of the customer's installation may prove excessive.

However, if human ingenuity can devise suitable apparatus employing the heat pump principle which can be sold on a competitive basis with other methods of heating, it would do much toward solving the electric house heating problem. This applies particularly to the milder climates such as normally prevail west of the Cascades.

(d) *Central Station Heating Method*—This method would employ electric boilers for feeding underground steam heating mains. This method would be similar to the ordinary central heating plant except that electric energy would be utilized in place of fuel.

In order to secure the greatest economy with this system, it would be necessary to locate the stations so that the sum of the fixed and operating costs would be a minimum when both stations and distribution systems are considered together.

What Types of Heating Installations and What Kinds of Fuel Are at Present Most Commonly Used for House Heating in the Northwest?

Information compiled in 1934 by the Department of Commerce gives the following data regarding the types of heating apparatus installed and kind of fuel used in Portland and Seattle:

Types of Heating Apparatus	Number of Installations Portland	Seattle
Hot air furnace	58,833	50,195
Steam or vapor	12,902	15,131
Hot water	2,520	16,877
Heating stoves	39,290	51,412
Other	1,483	1,653

Principal Fuels Used for Heating	Number of Installations Portland	Seattle
Coal	5,703	50,649
Wood	83,549	46,167
Gas	3,257	722
Oil	16,558	36,308
Other	5,935	1,335

What Factors Determine the Amount of Heat That Is Required?

The amount of heat which is re-

Table IV — Comparative Fuel Costs for Heating a 6-Room House
(Calculations Assume That 100,000,000 B.T.U. Are Delivered to Heating Space per Year.)

Fuel	B.T.U. Per Unit	Efficiency of Conversion Old Installation	New Installation	Fuel Units Required Old Installation	New Installation	Fuel Cost per Unit	Fuel Cost per Year Old Installation	New Installation
Electricity								
Direct radiation	3,412		100		29,300 Kw.-hr.	5.0 Mills per Kw.-hr.		$146.50
						7.5 Mills per Kw.-hr.		219.75
						10.0 Mills per Kw.-hr.		293.00
Heat storage	3,412		90		32,600 Kw.-hr.	5.0 Mills per Kw.-hr.		163.00
						7.5 Mills per Kw.-hr.		244.50
						10.0 Mills per Kw.-hr.		326.00
Heat pump	3,412		400		7,320 Kw.-hr.	5.0 Mills per Kw.-hr.		36.60
						7.5 Mills per Kw.-hr.		54.90
						10.0 Mills per Kw.-hr.		73.20
Artificial gas	484,500	85	85	237,000 cu. ft.	237,000 cu. ft.	*	$100.70	$100.70
Diesel fuel oil.....	5,180,000	60	70	1,350 gal.	1,158 gal.	5 cents per gal.	67.50	57.90
Gasco briquettes	23,540,000	50	60	8.48 tons	7.07 tons	$12.00 per ton	101.75	84.85
Rock Springs (Wyo.) coal.	19,850,000	50	60	10.08 tons	8.40 tons	11.75 per ton	118.45	98.70
Utah lump coal.....	21,250,000	50	60	9.40 tons	7.83 tons	13.00 per ton	122.20	101.80
Oak wood	26,550,000	45	55	8.37 tons	6.85 tons	10.00 per ton	83.70	68.50
Fir wood—old growth	17,850,000	45	55	12.45 tons	10.20 tons	7.50	93.40	76.50
Fir slab wood—old growth.	15,940,000	40	50	15.70 tons	12.55 tons	5.50	86.35	69.00
Fir sawdust	13,380,000	55	65	13.60 tons	11.50 tons	4.50	61.20	51.75

*Note—Figured at Portland Gas and Coke Company's heating rates as previously quoted. The yearly gas consumption was pro-rated by months according to the percentages given in the last column of Table II.

quired for a particular dwelling is governed by a number of factors. Among these the following are the most important:

(a) The volume which is to be heated.

(b) The difference between inside and outside temperature.

(c) The exposure.

(d) The insulation of the building.

(e) The amount of infiltration of air through cracks around doors and windows.

(f) Ventilation.

(g) Humidity.

What Factors Determine the Cost of Fuel for Heating?

The cost of fuel required to supply the necessary heat depends on the calorific value of the fuels used, on the overall efficiency of conversion, and on the cost of fuel per unit.

Approximate values for these are given below:

CALORIFIC VALUES OF FUELS COMMONLY USED IN THE NORTHWEST

Fuel	B.t.u. Per Unit
Electricity, (Kw.-hr.)	3,412
Artificial gas (1000 cu.ft.)	484,500
Diesel fuel oil (bbl.—42 gal.)	5,180,000
Gasco briquettes (ton)	23,540,000
Rock Springs (Wyo.) coal (ton)	19,850,000
Utah lump coal (ton)	21,250,000
Oak wood (cord)	26,550,000
Fir wood—old growth (cord)	17,850,000
Fir slab wood—old growth (cord)	15,940,000
Fir Sawdust (unit—200 cu.ft.)	13,380,000

NOTE: The above data taken from a bulletin entitled, "A Discussion of the Properties and Economies of Fuels Used in Oregon," Circular Series No. 1, September, 1929, by C. E. Thomas and G. D. Keerins of Engineering Experiment Station, O.S.C., Corvallis, Oregon.

ANNUAL OVERALL EFFICIENCY OF CONVERSION

Fuel	Efficiency of Conversion Per Cent
Electricity: Direct radiation	100
Electricity: Off peak	90
Electricity: Heat pump	400
Artificial gas	85
Diesel fuel oil	60—70
Gasco briquettes	50—60
Utah lump coal	50—60
Utah nut coal	50—60
Oak wood	45—55
Fir wood—old growth	45—55
Fir slab wood—old growth	40—50
Fir sawdust	55—65

NOTE: The above are considered to be average values only. The efficiencies will vary not only with the fuel but also with the installation and the manner of operation. The general trend is toward higher efficiency installations. The lower values given above are assumed for old installations and the higher values for new installations.

Table V — Comparative Annual Costs for Heating a 6-Room House (Calculations Assume That 100,000,000 B.T.U. Are Delivered to Heating Space per Year.)

Fuel	Fixed Charges 6% Interest	Fixed Charges 5% Depreciation	Fuel Costs Old Installation	Fuel Costs New Installation	Total Annual Costs Old Installation	Total Annual Costs New Installation
Electricity						
Direct Radiation						
5.0 Mill Energy	$ 15.00	$12.50		$146.50		$174.00
7.5 Mill Energy	15.00	12.50		219.75		247.25
10.0 Mill Energy	15.00	12.50		293.00		320.50
Heat Storage						
5.0 Mill Energy	33.00	27.50		163.00		223.50
7.5 Mill Energy	33.00	27.50		244.50		305.00
10.0 Mill Energy	33.00	27.50		326.00		386.50
Heat Pump						
5 Mill Energy	111.00	92.50		36.60		240.10
7.5 Mill Energy	111.00	92.50		54.90		258.40
10.0 Mill Energy	111.00	92.50		73.20		276.70
Artificial gas	19.50	16.25	$100.70	100.70	$136.45	136.45
Diesel fuel oil	33.00	27.50	67.50	57.90	128.00	118.40
Gasco briquettes	14.25	11.90	101.75	84.85	127.90	111.00
Rock Springs (Wyo.) coal.	14.25	11.90	118.45	98.70	144.60	124.85
Utah Lump coal	14.25	11.90	122.20	101.80	148.35	127.95
Oak wood	14.25	11.90	83.70	68.50	109.85	94.65
Fir wood—old growth	14.25	11.90	93.40	76.50	119.55	102.65
Fir slab wood—old growth.	14.25	11.90	86.35	69.00	112.50	95.15
Fir sawdust	15.75	13.15	61.20	51.75	90.10	80.65

Note—The above figures do not include maintenance. Fixed charges are based on average installation price.

COST OF FUEL PER UNIT

Fuel	Approx. Cost of Fuel
Artificial gas (1000 cu. ft.)	See below
Diesel fuel oil (bbl.—42 gal.)	$2.10
Gasco briquettes (ton)	12.00
Utah lump coal (ton)	13.00
Rock Springs coal (ton)	11.75
Oak wood (cord)	10.00
Fir wood—old growth (cord)	7.50
Fir—slab wood (cord)	5.50
Fir sawdust (unit—200 cu.ft.)	4.50

NOTE: The above prices assume fuel delivered in basement. These prices vary both with the season and location and may fluctuate considerably.

PORTLAND GAS & COKE CO.
HEATING RATES

First 300 cu. ft.	$ .90	
Next 2,000 cu. ft.	.765	per 1000 cu. ft.
Next 7,700 cu. ft.	.40	per 1000 cu. ft.
Next 40,000 cu. ft.	.35	per 1000 cu. ft.
Excess cu. ft.	.25	per 1000 cu. ft.

5 per cent discount on above for cash.

How Does the Cost of Different Methods of Heating Compare When Applied to a Typical Six-Room House?

INVESTMENT BY CUSTOMER

Fuel	Heating Installation Cost
Electricity: Direct radiation	$200— $300
Electricity: Heat storage	500— 600
Electricity: Heat pump	1,700—2,000
Artificial gas	300— 350
Diesel fuel oil	500— 600
Coal and briquettes	225— 250
Wood	225— 250
Sawdust	250— 275

NOTE: The above figures assume hot air furnace installations except in the case of electricity by direct radiation. The cost of fans for forced circulation or filters for cleaning air would be additional.

Fuel Costs.—Data for typical six-room house (Tables IV and V) assume that all six rooms will be heated currently. Comparative fuel costs are based on a delivery of 100,000,000 B.t.u. of utilizable heat during one heating season. This value is based on gas consumption for five six-room houses and an assumed overall conversion efficiency of 85 per cent. The values for higher or lower consumptions can be obtained by direct proportion.

What Advantages Has Auxiliary Electric Heating and to What Applications Is It Particularly Adapted?

Table VI gives the kw.-hr. per 1,000 cu. ft. per degree temperature difference as found by Professor Loew from the electric house heating data in Tacoma. These data are very significant in that they show very clearly that electric heat is most efficient when used for auxiliary heating where small temperature changes are involved.

Many applications can be found in the home where a small amount of additional heat may be needed as in a bathroom, breakfast room, kitchen or study room; likewise for use in late spring or early fall for adding a little quick heat in one or more rooms. For such an auxiliary service, and not general house heating, appears to be the proper field in which to apply electric heat.

Table VI — Kw.-hr. per 1,000 Cu. Ft. per Degree Temperature Difference, City of Tacoma

	Different Sizes of Residences				Apartments*	Res. with Elec. Furnaces**	
No. Consumers 50	29	40	19	12	51	18	
Vol. Range (cu. ft.) 4,500-6,300	6,300-8,100	8,100-9,900	9,900-11,700	11,700-15,300	..	..	Av. Outdoor Temp. Deg. F.
Av. Vol. (cu. ft.) 5,520	7,310	9,840	10,850	13,400	5,000	9,660	
Consumption (Kw.-hr.):							
Jan. 15.5	14.7	14.7	15.3	17.3	16.0	19.6	40.3
Feb. 16.3	14.0	14.3	14.4	15.5	14.2	18.2	42.8
March 17.7	16.3	15.2	16.2	16.2	13.0	21.4	44.6
April 14.8	12.5	13.8	14.0	14.7	11.0	19.1	47.2
May 18.7	14.9	16.0	18.5	18.8	13.3	22.1	53.6
June 14.3	12.6	11.0	14.0	14.2	11.9	13.6	60.6
July 11.7	7.3	7.0	10.0	7.6	7.7	7.9	61.4
Aug. 7.8	6.2	5.3	8.6	5.9	5.0	4.8	62.2
Sept. 7.7	6.2	4.9	6.8	5.4	5.5	5.0	56.3
Oct. 11.4	8.8	8.5	10.5	8.5	7.7	11.5	52.3
Nov. 12.4	10.1	9.9	10.9	9.6	9.2	13.0	45.6
Dec. 13.6	10.8	11.7	13.0	11.1	9.7	15.9	38.4
Total 161.9	134.4	132.3	152.2	144.8	124.2	172.1	
Average . 13.5	11.2	11.0	12.7	12.	10.35	14.3	50.4

*Full year apartment customers.
**Full year residence consumers having electric furnaces.

Discussion

George E. Quinan, Puget Sound Power & Light Co.—The general conclusion of the paper that house heating is not economical by electricity is correct. We shouldn't use cheap hydro power for house heating and then have to look around for a more costly source of power to turn our factory wheels.

It costs $60 to $70 a year to heat a small house in Seattle by presently used methods. Granted that some customers

might be willing to pay $150 for the convenience of electric heat, we would then have to sell him this power at 4½ to 5 mills per kw.-hr. which is not possible with primary power.

Puget Sound Power & Light Co. has a peak of about 200,000 kw. At 2:00 a.m. the load is about 75,000 kw., which means that there is a deep valley of 125,000 kw. available at that time of day. Electric water heating now is claiming a part of this excess, and water heating inherently can pay more than house heating. This is expected to absorb 25,000 to 35,000 kw. and, therefore, it might be argued that we have available 100,000 kw. for house heating provided this capacity were used in the deep valley period. This would mean that we would have to pump heat into storage for say 10 hours a day. We would need about 30 kw. per customer to meet the customer's peak heating requirement during the lowest temperatures. This would mean that we could take on possibly 3,000 installations of house heating at points on our system where line capacity is available. These customers would bring in to us approximately $500,000 of revenue. This same capacity, however, would supply 30,000 water heater customers, considering the normal diversity experienced in this class of business, who could and do readily pay us three-quarters of a cent per kw.-hr. This load would bring us upwards of a million dollars revenue per year, which, compared with the $500,000 revenue from house heating, leads us to conclude that the use of this excess capacity for house heating would be squandering hydro-power. This is true as long as there is any other possible use for hydro power. The above analysis does not take into account that even under present load conditions we need steam auxiliary, which is a further reason for not squandering our present surplus on house heating.

In the case of house heating by the heat pump method the situation might be different. Here the customer could pay in the neighborhood of 2c for power, if he could buy his equipment in the region of $750. Of course the equipment has not reached this low figure yet. However, 2c would be hardly enough for this service considering the poor load factor that would be obtained.

E. H. Collins, The Washington Water Power Co.—At Mason City, Washington, the contractor's camp for Coulee Dam construction, the contractor is using the surplus power in his power contract for house heating. His use of it for this purpose is based largely on expediency rather than on any definite formula. They are experimenting with storage heat using rocks in a pit, and on other methods, and data will be developed that should yield much valuable information relative to the different ways of house heating.

Winter Auxiliary and Summer Off-Peak Hot Water Service*

By S. B. CLARK
Northwestern Electric Co.

A STUDY of the many conditions under which present day domestic hot water service is sold to our customers leads one to believe that too many barriers exist to popularize hot water heating service in the same respect as other services have been popularized. Perhaps sales efforts have led prospective customers to expect too much of the recommended methods of hot water service, and that if a satisfactory supply be provided, rather expensive equipment must be acquired by the customer to obtain economical operation, this results in discarding all existing hot water facilities, or makes too many changes necessary before a proposed hot water service could be installed.

Many rate schedules for domestic hot water heating service are in effect, such as flat rate, limited or unlimited, off peak, etc., all requiring special or extra devices such as flat rate, check meters, separate and special meters, peak load limiters, time switches, clocks, etc., thus creating complicated service entrance wiring and equipment. Engineering efforts should make it possible for a rate schedule for hot water equipment that will furnish this type of service to the customer on an equal basis with that of the range, refrigerator, washing machine or ironer, with apparatus available on the open market and installed without restrictions or complicated wiring facilities. The electric range is an old story and is gladly sold to a consumer in any size without limitations as to consumption of energy or time of usage.

A rate schedule that permits of flat rate service is to a great extent unsatisfactory to both the serving company and the consumer—unsatisfactory from the company's standpoint, owing to the extremely low rate of return per kw.-hr., cost of connects and disconnects, loss of revenue during winter months from disconnects, and to the customers when flat rate service is disconnected during a mild winter. Customers having furnace coils in connection with flat rate heating object to the payment of a full flat rate schedule during winter months when furnace coils are supposed to supply an adequate amount of hot water. During mild weather periods, however, when there is little need for the furnace, electric hot water service would be appreciated, if it could be obtained without paying the full flat rate. Again, during summer vacation periods there are objections voiced by the consumers to the payment of flat rate billing while the home is not occupied.

If this class of service should be supplied to the consumer at an equitable rate on a metered service with the same unrestricted use as is allowable under flat rate schedules, we believe perfect satisfaction would result and peaking conditions would be no greater than with flat rate.

Off-peak service also has its drawbacks because of the expense to the serving company of complicated equipment, high initial installation cost to the consumer, and the resultant high storage stand-by losses. Consumer complaints plus company difficulties indicate that electric hot water heating as now offered is not perfect, and that there is still a field for development in application. The ideal method of energy supply to the domestic consumer would be a service similar to that supplied by water and gas companies with service available at all times without usage restrictions.

The large percentage of homes housing the average family are not able to afford the present large initial investment for supplying high class hot water service, but they would appreciate a less expensive type of hot water installation in which the operating cost could be controlled and kept within their means. In these homes there generally exists some kind of hot water service in the form of an uninsulated 30 or 40-gal. tank, heated during winter months with furnace coils and for auxiliary service in mild spring, fall, and summer months with gas or fire pot heater. With these facilities, a fairly satisfactory service is obtained. This kind of installation appears to offer a field for electric hot

*A report of the Utilization Committee, Engineering and Operation Section.

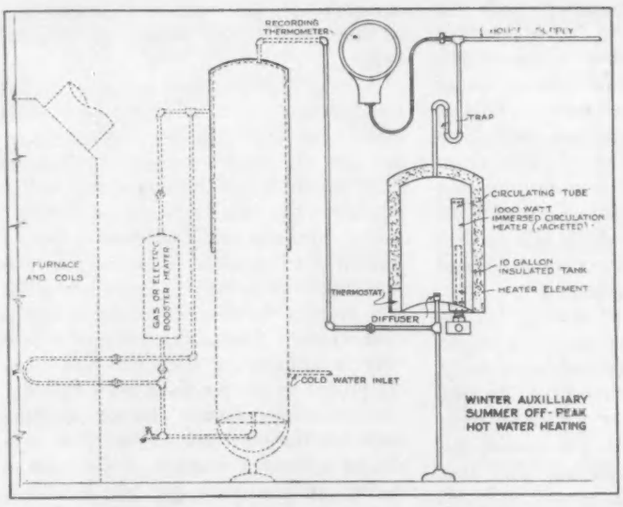


Fig. 1—Winter auxiliary and summer off-peak water heating installation set up for testing

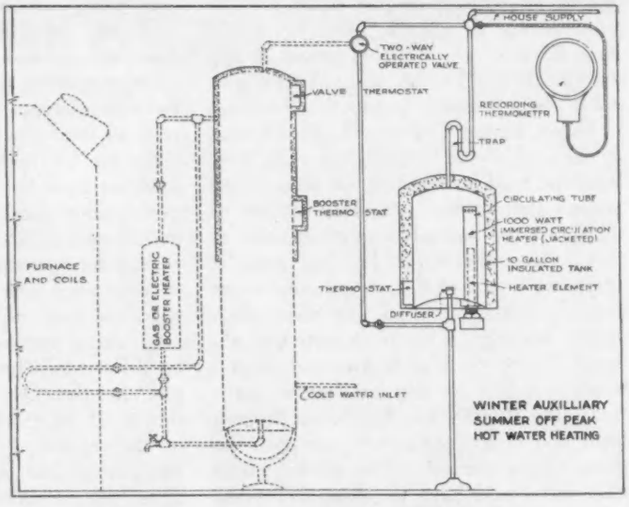


Fig. 2—Same installation as Fig. 1 with valves and thermostats arranged for additional tests

water heating service in which existing facilities are supplemented by auxiliary equipment of low first cost, reasonable in operation, and requiring little personal attention. If such service could be furnished, the utility would be assured of a yearly revenue that could not otherwise be obtained.

Test of Auxiliary Heater

To see if such a scheme was feasible, trial equipment was installed and a check of performance kept. The home in which this trial test was made was a large one with two baths and with a family of three entertaining the ordinary amount of company. The furnace was fired by an automatic deep-burning tyree coal stoker, which, when in operation, gave a flame in effect very similar to that of an oil burner. The coils in the furnace were only of medium length and had never tended to over-heat the storage water in the 40-gal. tank, even in extreme cold weather. Hot water pipes all had rather long runs and were uncovered. The equipment used for trial consisted of a 10-gal. galvanized tank, covered with two layers of 1 in. 85 per cent magnesia, and a 1,000-watt internal circulating heater. Top of circulating tube was arranged with adjustable openings for restricted circulation. The trial runs were made with two ¼-in. holes open at the top. This small tank was installed as an auxiliary to the existing uncovered 40-gal. tank, heated by furnace coils for winter hot water service and by a gas heater in summer.

A booster electric heater was installed as an auxiliary to the large tank for comparative operation with that of gas. Two layers of 36-in. width ordinary corrugated wrapping paper were wrapped around the top of the 40-gal. tank for insulation to insure thermostatic operation. A water meter was placed in the cold water line and a recording thermometer in the line to the house service, with the bulb arranged so as to record the temperature and the time of usage of all hot water.

Fig. 1 shows diagrammatically a 10-gal. tank as an auxiliary to an existing furnace tank. In this case the furnace tank is used as a tempering tank only, as all hot water drawn flows through this tank into the auxiliary electrically heated tank.

The equipment used in the experiment was assembled as shown in Fig. 2, with the 10-gal. tank connected to the existing furnace tank as an auxiliary, but with a control valve installed between the furnace tank and auxiliary heater. This control valve is operated by a thermostat located as near as possible to the top of the furnace tank. At such times as water at the extreme top of the furnace tank reaches the set value of this thermostat, approximately 130 deg., water flows through connection directly to the house supply, cutting off any flow down the riser intake to the 10-gal. tank. This operation holds the auxiliary 10-gal. tank out of service at all times until water at the top of the furnace tank goes below the temperature level of the thermostat setting. The thermostat at the bottom of the 10-gal. tank maintains the predetermined temperature of water at all times in the 10-gal. auxiliary. The valve used was an ordinary 3-way solenoid operated home-made affair. The operation was quite satisfactory for the trial but quite noisy. Another solenoid valve was made, which proved satisfactory, but a more simple thermal strip valve is under consideration, which should prove more satisfactory as well as being considerably lower in cost.

Fig. 3 shows typical charts assembled to illustrate the synchronized operation of this equipment for average operating conditions during winter months. The top row of charts is valve operation; the middle row of charts shows water draw-off periods with the temperature of the water drawn off; and the bottom row of charts indicates on and off periods of the 1,000-watt immersed circulating heater.

Referring to Column 1, the valve chart shows the operating valve on during the entire 24-hr. period. The valve in this position has completely isolated the small auxiliary heater from the furnace tank. The draw-off period chart shows water drawn intermittently throughout the day, from 7:15 until some time after 11:00 o'clock at night. In all cases the curve peaking points showing draw-off do not indicate the water temperature correctly, owing to the sluggishness of the recording thermometer bulb in reaching the actual temperature of water draw-off when small amounts of water are used. The lower chart, recording on and off periods of the auxiliary heater, shows on this day three periods of heating, indicating that the 1,000-watt heater is simply maintaining temperature in the small tank, taking care of radiation, and the consumption was 2 kw.-hr. The weather on the day represented by Column 1 was cold, requiring furnace fire at intervals during the entire day. On this day the water heater showed a usage of 32.1 gal. of water.

In Column 2 it will be noted that the valve has remained closed only a portion of the 24 hrs., from 1:00 p.m. to 9:30 a.m., indicating that furnace coils supplied the necessary amount of hot water except between 9:30 a.m. and 1:00 p.m. The water draw-off period,

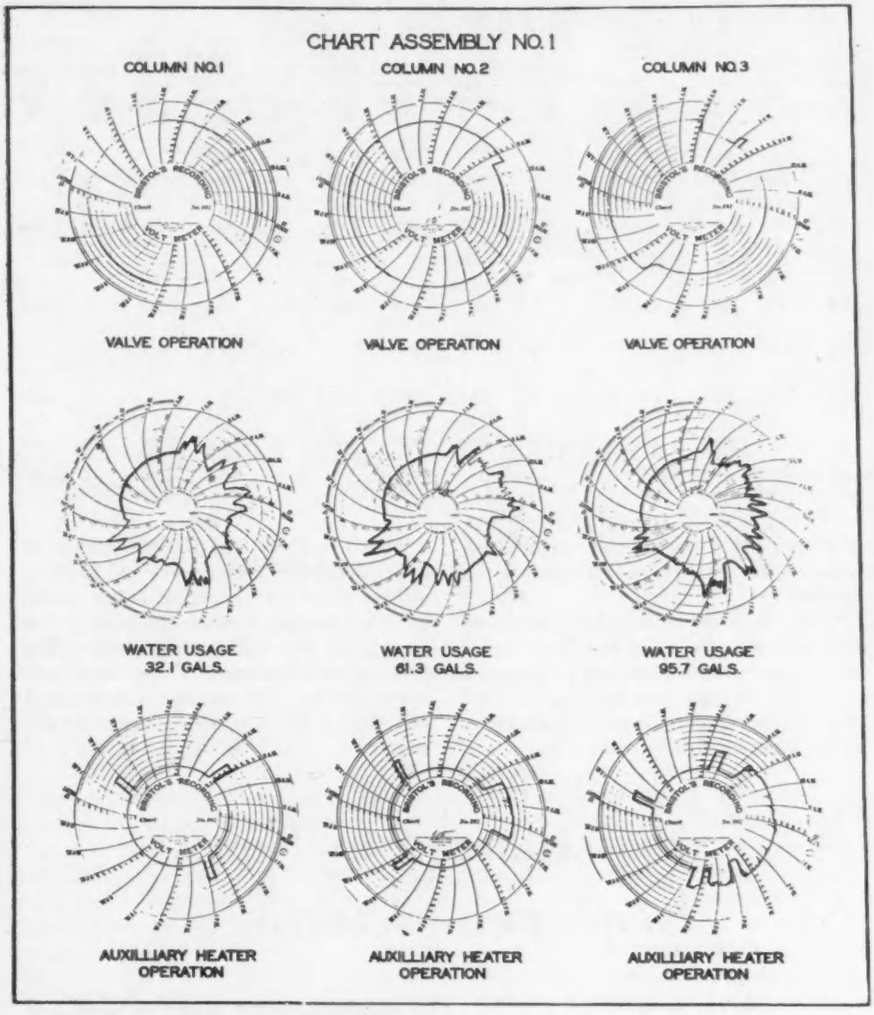


Fig. 3—Charts showing usage and heater operation under varying conditions during winter months

beginning at approximately 7:30 a.m., is shown on the water draw-off chart, the last draw-off taking place about 11:15 a.m. The bottom chart shows time of auxiliary tank in service supplementing furnace tank during non-supply period, namely, the time between 8:30 a.m. and 1:00 p.m. It will be noted that during the night the operation of the 1,000-watt heater is very similar to that of the preceding chart, in that the 1,000-watt heater merely maintained the proper temperature in the small tank during the period that the furnace was supplying the hot water requirements. The day on which Column 2 charts were taken was rainy and much warmer than the day on which charts in Column 1 were taken. On this day the usage was 61.3 gal. of water, and 4 kw.-hr. were used on the auxiliary heater.

The valve operation chart in Column 3 indicates that furnace tank service was available for a shorter period than on the days of the preceding charts, the valve being closed only from 8:00 o'clock in the evening until 6:00 o'clock in the morning, throwing the service usage on the auxiliary tank from 6:00 a.m. until 7:45 in the evening. The middle, or draw-off chart, on this way shows rather a continuous water usage. The bottom chart, or operating time of the auxiliary heater, shows a considerably longer "on" time period than do the two preceding charts, the auxiliary heating going into service shortly after 8:00 a.m. and staying on continuously until some time after 5:00 p.m. This day was a warm day with practically no furnace fire from 8:00 a.m. until about 6:00 p.m. The usage on this particular day was 95.7 gal., with 11 kw.-hr. used on the 10-gal. auxiliary heater.

Charts shown are typical of differing weather conditions for the entire month's trial period. This particular month had several mild days and some very cold days. The kilowatt hour and hour and water usage in gallons per day are perhaps not one hundred per cent accurate, as the water meter could not be read closely, but the average result for the month is quite accurate.

Table I shows the average performance, for the test period, of the small tank used as an auxiliary to the furnace tank. In the colder months the average operation would be very similar to that shown in Column 1 of Chart Assembly

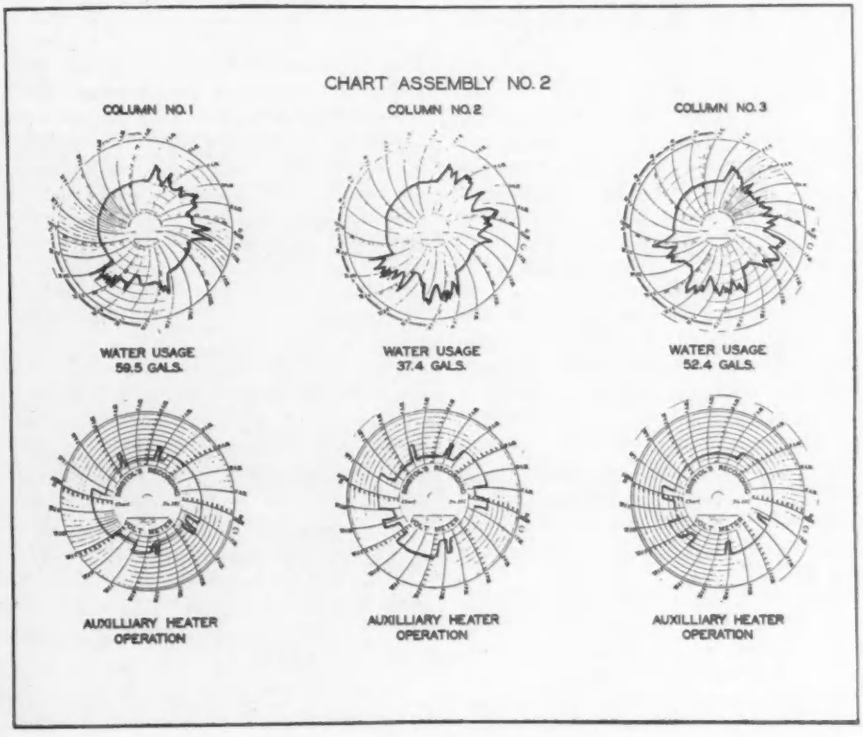


Fig. 4—Charts showing usage and heater operation under varying conditions during summer months

Table I — Electric Water Heater Tests

Description	Size of Heating Element Watts	Av. Hot Water Temp. Deg. F.	Min. Hot Water Temp. Deg. F.	Kw.-Hr. Used	Total B.t.u. Draw-off	B.t.u. Per K.w.-Hr.	Efficiency %	Gal. Hot Water Drawn Off	Gal. Hot Water Per Kw.-Hr.	Temp. Rise Deg. F.	Av. Amt. of Water Used Per Day Gal.	Av. Kw.-Hr. Used Per Day	Length of Run Days	Load Factor %
TABULATION NO. 1														
10-gal. tank with furnace coils; 29 days actual run. (Cold water temp. 48 deg. F.—temp. rise 114 deg. F.)	1,000	162.0	120	103.0	988,800	9,600	280.1	1,021	9.92	114	35.3	3.55	29	14.6
*30-gal. insulated tank (with tempering tank) (Cold water temp. 52 deg. F.—temp. rise 103 deg. F.)	900	151.0	138	93.0	249,580	2,684	78.7	300	3.22	103	50.0	15.5	6	14.3
TABULATION NO. 2														
10-gal. tank, no furnace coils; 25 days actual run; 4 days stand-by. (Cold water temp. 48 deg. F.—temp. rise 114 deg. F.)	1,000	162.0	120	243.5	788,940	3,240	95.0	815	3.35	114	32.6	9.74	25	33.8
*30-gal. tempering jacketed tank (double tank) (Cold water temp. 52 deg. F.—temp. rise 103 deg. F.)	900	157.0	148	163.0	523,278	3,210	94.1	600	3.68	103	50.0	13.6	12	25.1
*30-gal manufactured tank (no cold water tempering) (Cold water temp. 52 deg. F.—temp. rise 103 deg. F.)	1,000	154.5	130	204.0	590,856	2,896	84.9	700	3.43	103	50.0	14.5	14	28.3
*30-gal. manufactured tank (no cold water tempering) (Cold water temp. 52 deg. F.—temp. rise 103 deg. F.)	1,750	151.0	134	207.0	614,469	2,960	87.0	750	3.60	103	50.0	13.8	15	16.4

*Data taken from trade journals and similar sources for purposes of comparison.

No. 1, and in the milder months to that shown in Column 3.

Fig. 4 shows operation of the 10-gal. auxiliary tank as a straight hot water service heater plus usage of either an electric or a gas heater as a booster, for summer use. These charts are typical of what might occur during the summer months without furnace operation. Column 1, top chart shows periods of draw-off from 7:15 a.m. until 10:00 p.m. The bottom chart shows the time "on" of the 1,000-watt heater during the day. On this particular day the usage was 59.8 gal. of water, 12 kw.-hr. usage on the 1,000-watt auxiliary tank, and 3 kw.-hr. used on the electric booster. Column 2 shows the same operations with a usage of 37.4 gal. of water, 11 kw.-hr. being used on the auxiliary tank, with none on the booster. The third column shows a like operation for a day with a usage of 52.4 gal. of water, and 14 kw.-hr. used on the 10-gal. tank. All charts in Fig. 4 show rather a high usage, considerably above normal for this size family. The higher usage charts were selected in order to show that with the average size family the draw-off can be above normal and still good hot water service will be delivered.

Table I gives the average result over the test period of this 10-gal. tank in operation as a summer heater, without assistance from the furnace tank.

Conclusions

In view of the foregoing and with the thought of increased domestic consumption, especially for domestic hot water service, the following conclusions are reached.

If complicated service entrance equipment is of absolute necessity in order to supply hot water requirements under present day hot water equipment standards, engineering should be directed along lines of equipment design so as to permit of a simplified service entrance with energy measurements on one meter.

A 10-gal. tank installed as described will provide an excellent hot water service for all the ordinary usage of hot water in the average family and with a yearly average energy usage of not to exceed 2,400 kw.-hr.

This type of installation seems to have desirable characteristics for the utility, since its operation as an auxiliary in winter throws its winter use largely off the daily system peak. The peaking requirements of the load will occur during the warmer winter days and during the summer months of the year.

Experiences in New Sequence Metering*

By A. H. KREUL
Portland General Electric Co.

TWO outstanding questions on the application of new sequence metering are presenting themselves to those metermen who are contemplating its adoption, as well as to those who have already placed installations in the field, viz., selecting the proper type of equipment for existing conditions and satisfactorily meeting the troubles which may arise from having the meter installed under the new method.

In order to secure information on these questions, the following questionnaire was sent to eleven operating companies in the Northwest:

1. Approximately how many new sequence meter installations now on your lines?
2. Are you using the "B" meter which includes test device?
3. Any comments on latest designs?
4. Have you encountered any trouble by installing meters ahead of main line fuses?

Eight replies were received and the information has been tabulated in Tables I, II and III.

These tables indicate that the socket type meter is more widely used for new sequence metering than the old type meter placed in a box. There is much less objection to the appearance of the socket type meter on the side of a customer's house than to a metal box, and this fact has much to do with its large use. One company reports that it is a simple matter to add a range and water heater with a time clock on an existing socket type lighting installation. No companies reported the use of the "B" meter, i.e., the ordinary meter with test blocks, although several see desirable features of this type.

The tabulation further shows that out of a total of 11,847 new sequence meter installations, 4,229, or over one-third of the installations were made with reconstructed meters. Six of the eight companies reporting are reconstructing meters and the tendency to do more of this work is increasing.

"H" company, which has rebuilt 1,300 old meters into the socket type,

*A report of the Meter Subcommittee of Utilization Committee, Engineering and Operation Section.

Table I — New Sequence Meter Installations

Company	New Meters (Socket Type)	Reconstructed Meters (Socket Type)	Old Meters (In boxes)	Total
A	944	1,241	0	2,185
B	125	125	0	250
C	0	150	0	150
D	610	0	0	610
E	700	0	0	700
F	525	525	0	1,050
G	1,264	888	550	2,702
H	2,200	1,300	700	4,200
Total	6,368	4,229	1,250	11,847

Table II — New Socket Type Meter Installations

Company	Mfg. A	Mfg. B	Mfg. C	Total
A	0	0	944	944
B	0	125	0	125
C	0	0	0	0
D	195	415	0	610
E	0	700	0	700
F	0	525	0	525
G	0	1,264	0	1,264
H	200	1,700	300	2,200
Total	395	4,729	1,244	6,368

Table III — Reconstructed Meter (Socket Type) Installations

Company	Mfg. A	Mfg. B	Mfg. C	Total
A	164 I-14	38 OA	1,039 H and HC	1,241
B	125 I-14 and I-16	0	0	125
C	0	150 OA and OB	0	150
D	0	0	0	0
E	0	0	0	0
F	525 I-14	0	0	525
G	888 I-14 and I-16	0	0	888
H	500 I-14, I-16, I-20	400 OB	400 H	1,300
Total	2,202	588	1,439	4,229

Table IV — Cost of Reconstructing Meters

Company	Type	Material	Labor	Total
Mfg. A	I-14, I-16, I-20	$3.50	$1.50	$5.00
Mfg. B	OB-OC	3.50	1.00	4.50
Mfg. C	H-HC	3.50	1.00	4.50

reports costs on various types and makes of meters in Table IV.

The costs were based on labor at $6.00 per day and do not include any overhead expense. The difference in labor cost in changing over the makes of Manufacturer A is due to the necessity of dismantling the assemblies before they can again be remounted on the new bases. The assemblies of the other makes can be remounted intact thereby saving time.

A routine method of an insulation test on all reconstructed meters has been recently instituted. After the meter has been rebuilt and before final calibration, a standard voltage test, i.e., 1,000 volts plus double the rated voltage of the meter, is applied from the potential and current coils to ground. At present no test is made between the current and potential coils, as few failures have been experienced from this source. After the insulation test has been made, the meter is adjusted for final calibration.

"H" Company also reports in Tables V and VI the costs of moving lighting, range and water heater meters from the inside to the outside of the house, as well as costs of installing old lighting meters in boxes on houses and on poles.

Fig. 1 (Left)—Socket type meter installed on a pole. The box below contains a time switch for controlling a floodlight mounted at top of pole. (Right)—A metal box housing an old type meter and test blocks

Table V — Costs of Moving Meters

Items	Light	Light and Range	Light, Range and Water Heater (2 meters)
Reconstructed Meter (Socket Type)	$5.00	$ 5.00	$10.00
Material	1.50	3.50	4.00
Labor	2.50	3.00	3.50
Cartage	.50	.50	.50
Total	$9.50	$12.00	$18.00

Table VI — Lighting Installation With Metal Box

Items	On House	On Pole
Meter Box	$3.40	$ 3.40
Material	1.15	4.43
Labor	3.00	3.00
Cartage	.50	.50
Total	$8.05	$11.33

These installations are made by a journeyman wireman at $7.40 per day, and a helper at $4.26 per day. The auto cartage is at the rate of 5c per mile. No overhead expenses or wiring permits are included in these costs.

The replies to question No. 3 regarding comments on the latest design were confined almost wholly to the socket type meter.

Several companies commented on the inconvenience of having counter-sunk hexagon nuts on the back of the terminal block, thereby requiring a special socket wrench to change the block from a vertical to a horizontal installation. Much care is required in using the wrench to prevent twisting off the end of the screw.

General approval is given to the recent change in the terminal block with the large sleeve connection and set screw, as compared with the former terminal, which necessitated the soldering of a lug on the end of the wire to complete the connection.

Only one company reported using the circuit closing clips, giving as its reason the desire to supply continuous service. Several companies present the argument that as the service is interrupted only once in five years during the meter test, the additional cost of the clip is not justified.

Little value is seen in the small sealing stud located on the back of the meter and used to seal the glass cover to the base. Some companies are leaving out this stud entirely.

One company favors the type "B" meter, although it has none installed, because it is not necessary to interrupt service to connect testing instruments,

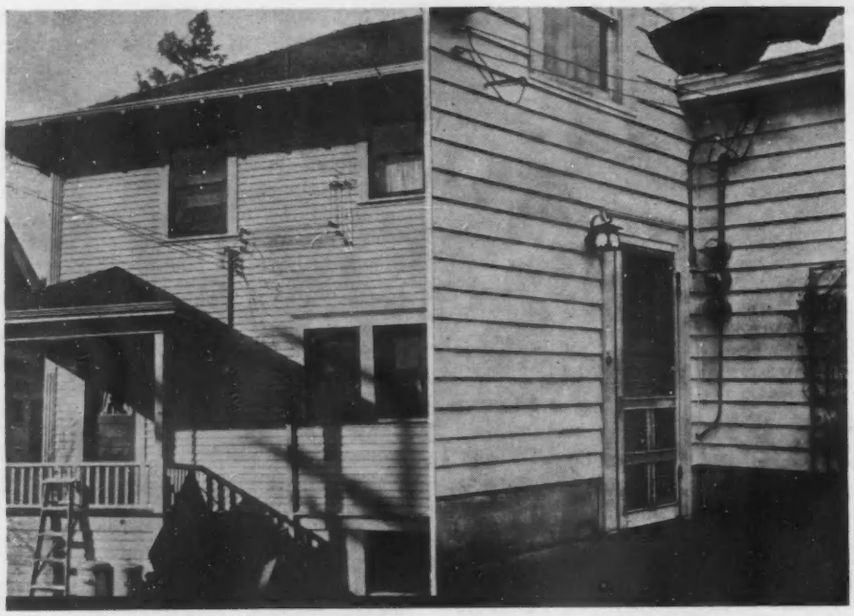


Fig. 2 (Left)—Socket type meter on a combined range and lighting service. The old meter originally was located in the bathroom on the second floor. (Right)—New socket type meters and time switch on a combined range, water heating and lighting service. Old lighting service was at upper left

and it is easy to jumper. Its shape conforms to the present day meter and it can be adapted to trim boxes.

Another company suggest that the sealing rings around the glass cover have a lever arrangement for tightening instead of screws.

Some kind of a double terminal in the socket base would be very desirable in order to connect to two different circuits. At present it is necessary to put two conductors in one terminal under a single screw, and when the conductors are of a different size, the connection under the screw is not always secure.

Several companies think it desirable to have some kind of a disconnecting device to cut out the service which can be seen through the front of the meter. The present method of disconnecting the service requires that the meter be removed from the socket so that the circuit can be opened after which the meter is replaced. Inspectors, meter readers, solicitors, and collectors should be able to see whether or not the service is in or out without having to remove the meter.

One company reports that the hot rays of the sun through the glass cover caused the enamel on the meter dial face to peel off. The suggestion is made that the numerals be stamped on the face of the dial and then filled with enamel which could be replaced when necessary.

The replies to question No. 4 as to trouble encountered by installing meters ahead of main line fuses are summarized as follows:

Companies "A," "B," "C" and "D" report no trouble whatever from this source to date. These companies have about 3,195 installations. "B" company is located in a section of the country where there is considerable lightning and, while having experienced no trouble, speculates as to future damage from this source with added installations.

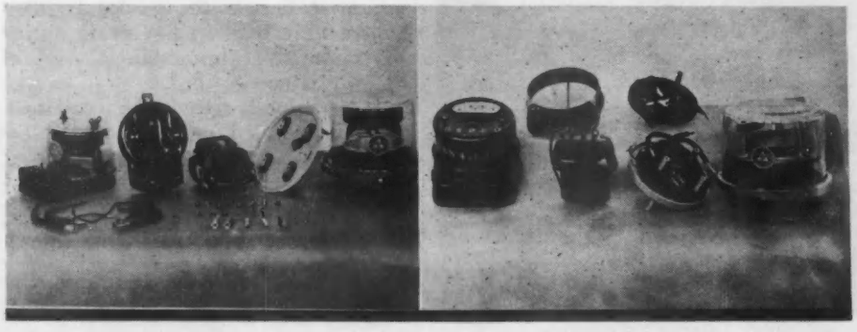
"E" company has had twelve cases where condensation has gathered inside of the meter to such an extent that the lower terminals of the meter were shorted and burned. In some instances moisture gathered in the socket where the line and load wires were combined in the one conduit entering the tap, with a plug in the lower opening of the socket. All of these installations were subjected to the direct rays of the sun during the day and to extremely cold weather at night. Similar condensation was experienced with a type "C" meter which was located over a restaurant door. Frequent opening and closing of the door in the winter time caused moisture in the meter.

"F" company reports one socket type meter shorting out due to water in the socket. No damage was done to the customer's premises and the service remained uninterrupted. The meter reader discovered the damaged meter during his reading trip. The present method in use to eliminate this source of trouble is to drill two small holes through the back of the socket at the lower edge for the purpose of draining the water. By locating the holes at the back of the meter instead of at the bottom, no opportunity is given to anyone to insert a wire into the meter and interfere with its registration.

"G" company reports two instances where water collected in the socket and caused damage to the meter. A broken glass cover was responsible in one case for moisture entering the socket and a faulty service pipe installation was responsible for the other. Both locations were on the coast and both resulted in blown transformer fuses and damaged meter elements.

"H" company reports four cases where sockets become grounded on account of moisture in the base. In every case either the lower right or left terminal blade grounded on the back of the meter case and a large hole was burned in the back plate. All installations were located on the south side of buildings where rain and wind is most severe and can most easily enter the service head which is tilted upward at a forty-five degree angle. An effort is now being made to have contractors and wiremen bend the top part of the conduit slightly outward so that the bottom of the service head will be in a horizontal position.

Fig. 3 (Left)—Reconstruction parts for type OB meter showing old meter, old base, assembly of coils and laminations, new base plate and reconstructed meter. (Right)—Reconstruction parts for type I-14 meter showing old meter, base sawed off and plate retained for mounting, assembly of coils and laminations, assembly mounted on repainted plate and finally reconstructed meter



It is pointed out that there were eighteen cases where grounds occurred due to moisture out of 11,847 installations of new sequence metering and in no instance was there damage done to the customer's property.

A summary of the experiences contained in the foregoing information presents four important points for consideration:

1. New sequence metering has passed the experimental stage and is increasing so rapidly that, with an improvement in economic conditions, definite programs of expansion may be seriously considered.

2. There is now a growing tendency to reconstruct old meters, or otherwise adapt them to new sequence metering, rather than purchase new meters.

3. New metering equipment is passing through the development period and manufacturers are quick to correct defects and make improvements.

4. Moisture may become a serious menace to outdoor metering and it is essential that installations be made in the best possible way to eliminate it.

Some Technical Phases of Developing Lighting Load*

By F. H. MURPHY
Portland General Electric Co.

THE illumination division is logically a section of the new business portion of the commercial department. It is not, however, primarily a sales organization. It is rather a service organization and I might go further and state that it is a technical service organization, for it is charged with blending the forces of nature with human reactions and economic limitations in such a manner as to produce satisfactory results both to the public and to the utility.

The problem of the illumination engineer is to know the needs of the customer for light, to know the possibilities of the light source, how to control its output to the advantage of the customer and how this light source properly controlled will produce greater all-around satisfaction to the customer which will react to his economic advantage. If this is done in a thorough and effective manner, it will result in a customer who will be a profitable user of energy and not a loafer.

Home Lighting

About 70 per cent of our residential customers are below the average in the use of energy and in general this is the same class that cannot be readily interested in ranges, refrigerators, etc., but must first be built up into more profitable customers through the medium of better lighting. If this is to be accomplished, however, the customer must be shown that it is to his own advantage to use more light. This requires painstaking selling to be effective and lasting, and the salesman must be thoroughly familiar with his product and its possibilities.

In an effort to educate the people to understand the vital importance to themselves of proper illumination, the larger utilities have recently established home lighting service bureaus, which provide carefully trained women to show the housewife how she can have safe and adequate lighting in her home. If the conference has been arranged at the convenience of the housewife and it does not have to be a hurried interview, the chances are good that the customer will be a continuing user of whatever lighting load may be necessary to give her adequate home illumination. She is interested in her home and her family and she is willing to spend a reasonable amount for their benefit, particularly where the eyesight and general welfare of her children are concerned, if she can be convinced that the added expenditure will produce the results she expects. This is strictly in the field of education —not in that of high pressure salesmanship.

Since the work of the home lighting service bureau is primarily educational, it cannot be handled in the usual sales manner. The conferences with the housewife must be made to suit her convenience and not at random and at unexpected times; nor must they be hurried through lest the subject, which is comparatively new to most people, be not properly presented. This precludes the idea of holding the utility representative to a certain quota of calls per day or per month, or to a minimum wattage of increased load per call. If the representative has been properly selected in the first place, she will not waste either her own or the customer's time, and she should not have the mental hazard of a quota hanging over her head. Naturally, records should be kept to show the results accomplished, but their value lies in their proper use and not in their abuse. A home lighting service bureau conducted along the lines of this educational sales approach will, in most cases, show a revenue increase sufficient to pay its expenses, and will have to its credit a great deal of general educational work on illumination.

School Room Lighting

School room lighting has not kept pace with the growth of knowledge as to its value and we have today many glaring examples of what should be avoided in our schools. We know that defective eyesight in our children during their course through the elementary and high schools increases from 4 or 5 per cent to 22 per cent. This is a serious toll. It is naturally not all due to improper lighting in the schools. Part of it is chargeable to school lighting, part to home lighting, and some to other causes; but when we know that a large part of this increase in visual defects is chargeable to improper illumination somewhere and is therefore preventable, we are guilty of criminal negligence to permit it to continue unchecked.

The school board member is equally responsible with the parent for perpetuating a condition that should not exist once the results of that condition have been brought to his attention, but he is not always able to correct the evil. The parent is spending his own money, while the school board member is spending someone else's money and is constantly reminded of this fact by the taxpayers' league. The school board member must therefore be reinforced by "facts" usu-

*A report of the Utilization Committee, Engineering and Operation Section.

Industrial Surveys for Load Building*

By PAUL P. ASHWORTH
Utah Power & Light Co.

*Published in the May, 1935 number of Electrical West, page 19.

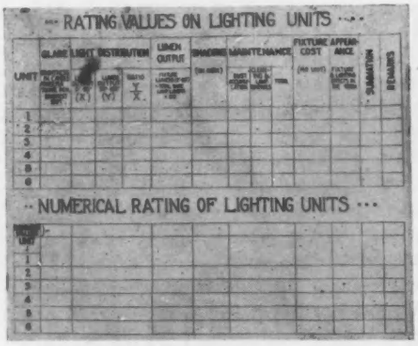


Fig. 1—Standard form for rating school lighting fixtures

ally in the form of results obtained in his own locality.

Recently, a school board in a high-class residential district near a large city came to the utility engineers and asked for assistance in lighting its new school building. As a result, that school is equipped with indirect fixtures producing a lighting intensity of 25 to 30 foot-candles, and the community is delighted. If the houses in that district are as considerate of their home lighting, a great advance will have been made in eyesight conservation for the children in the district.

Another school board in a large district came to the conclusion that it was failing to get proper lighting installations because it was compelled to award the contract to the lowest responsible bidder. This board, therefore, came to the utility engineers and asked if some means could be devised that would enable it to rate lighting fixtures on some basis other than price alone. As a result of the set of charts developed for this purpose (four reproduced—Fig. 1-4—with sample specifications), the lighting installations were stepped up from an inferior grade of direct lighting to the semi-indirect class and occasionally an indirect installation. With recent developments in indirect fixtures which make them attractive, efficient and in a price class with semi-indirect fixtures, it is probable that there will be a definite trend toward indirect lighting for future installations.

The light intensity at the far side of my office on a bright day, without artificial illumination, measures 5 foot-candles. What must happen on cloudy days to the inside row of desks in a school room, where in most cases these desks are more than 20 ft. from the window? We have made many tests under such conditions and find that the lighting usually measures from 1 to 2 foot-candles, sometimes less. Yet we expect our children to be alert and interested in their work under such lighting. In an endeavor to correct just such conditions, the illumination engineers of the Alabama Power Co., in cooperation with the Superintendent of Schools of Tuscumbia, Ala., carried on a very important experiment.

They selected two school rooms of the same size and same exposure, placed an equal number of students in each room under teachers whose methods of teaching were similar, and took great pains to see that the pupils in each room were balanced as equally as possible in regard to talents, intelligence and past achievements. In room No. 1 the existing lighting was left as it was with two 150-watt lamps in direct lighting fixtures controlled at will by a wall switch. In room No. 2, four 300-watt totally indirect lighting units were installed and placed under control of a photo-electric relay set to maintain at all times a minimum of 12 foot-candles on the poorest lighted desk. At the end of the year, there were eleven failures out of 34 pupils in room No. 1 and two failures out of 36 pupils in room No. 2. The experiment was repeated the following year with practically the same results.

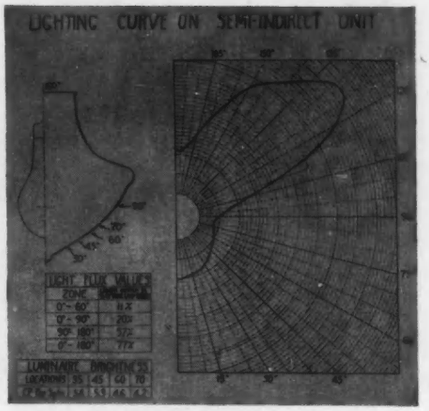


Fig. 2—Standards required for semi-indirect fixtures for schools

The cost of lighting the entire room for 100 per cent of the time is less than the cost of training even one pupil for another year because he failed to pass, to say nothing of the benefit to the eyesight of all the other pupils in the room.

School District No. 1 in Portland has recently appropriated money to carry on a comparison test next year, but because of the use of the platoon system of teaching, it will not be possible to check results in the same way as was done in Tuscumbia. It is also encouraging to know that money was appropriated to improve the lighting in the sight-saving classrooms.

Two other phases of special lighting for school rooms which require technical salesmanship are blackboard lighting and to a certain extent the use of health lamps or artificial sunlight in special rooms. Blackboard lighting should come from above and slightly in front of the boards. It should distribute the light uniformly over the surface of the boards and produce an illumination intensity at least equal to that provided in the rest of the room. If the surface of the lighting unit is visible to the pupils, it should be provided with louvres or a valence should be dropped from the ceiling to a point where it will cut off all view of the lighted surface.

The provision of artificial sunlight has possibilities for school rooms in sections of the country where much cloudy

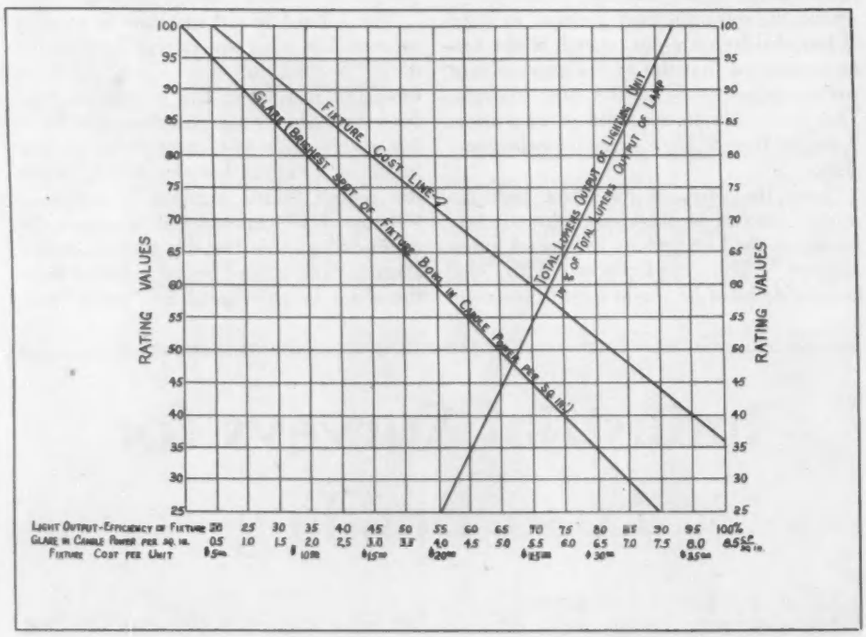

RATING VALUES
RATING VALUES
Fixture Cost Line
Glare (Brightest Spot of Fixture Bowl in Candle Power per Sq. In.)
Total Lumens Output of Lighting Unit in % of Total Lumens Output of Lamp
Light Output-Efficiency of Fixture
Glare in Candle Power per Sq. In.
Fixture Cost per Unit

Fig. 3—Rating curves developed by tests for school fixtures

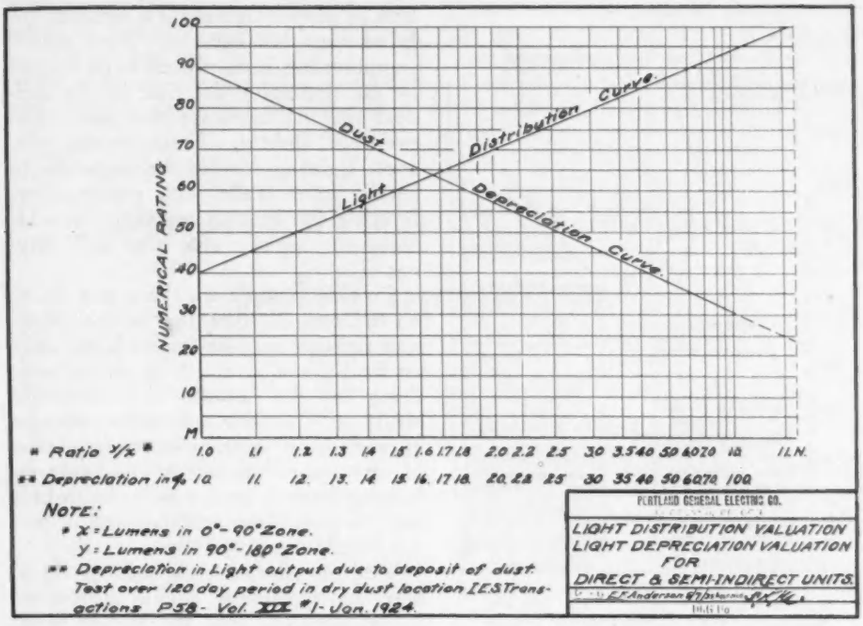

NUMERICAL RATING
Dust
Distribution Curve
Light
Depreciation Curve
* Ratio Y/X *
** Depreciation in %
NOTE:
* X = Lumens in 0°-90° Zone.
Y = Lumens in 90°-180° Zone.
** Depreciation in Light output due to deposit of dust. Test over 120 day period in dry dust location I.E.S. Transactions P58 - Vol. XIX #1 - Jan. 1924.
PORTLAND GENERAL ELECTRIC CO.
LIGHT DISTRIBUTION VALUATION
LIGHT DEPRECIATION VALUATION
FOR
DIRECT & SEMI-INDIRECT UNITS.

Fig. 4—Rating curves for distribution and depreciation for school fixtures

weather prevails, but for the present its use will be confined to rooms provided for undernourished children or to gymnasiums.

Commercial Lighting

The development of the photronic cell type of light-measuring instruments has revolutionized the selling of illumination in the commercial field as well as in the home. It is now possible to demonstrate various effects conclusively to the customer which he formerly took on faith, if at all. Light meters like all good things may, however, be used in the wrong way and to the disadvantage of the customer. Periodically, we are visited with a plague of inferior lighting fixtures which are planted over the territory by high-pressure salesmen who are here today and gone tomorrow, leaving those of us who are more or less permanently fixed to face the grief. A recent epidemic of that nature has swept up from California, using the sales argument that the glass is made by a prominent glass manufacturer and that the efficiency is high. Both of these arguments are meaningless without other qualifications. All glass manufacturers can make varying grades of glass, particularly of the poorer grades. It is also well known that lack of diffusing qualities usually results in increased efficiency. In fact, a bare lamp is a more efficient lighting unit alone than when used with any enclosing globe.

The unit in question is a very light density opalescent type of spherical enclosing glass with a corrugated outer surface. Obviously, it is a glaring light source and a test sheet shows that it has a surface brightness ranging up to 9 or 10 candle power per square inch. Light sources in the field of vision should not have a brightness in excess of 3 candle

Sample Specifications (To permit rating of lighting units)

The following essential information pertaining to the lighting units offered must accompany quotations.

(a) Curve showing typical vertical distribution of light from the unit proposed in the bid.

(b) Per cent of total lumen output of the lamp distributed by the unit in the following zones:
0 degree — 60 degree
0 degree — 90 degree
90 degree — 180 degree
0 degree — 180 degree

(c) Location of brightest portion of the lighting unit within the ordinary range of vision, and the brightness of this exposed portion of the unit in either c.p. per sq. in. or in milliamberts, which must be determined by using the same size lamp and lighting unit as called for in the specification and proposed in the bid.

The data and curves must be determined and prepared by a standard testing laboratory such as the U. S. Bureau of Standards, Electrical Testing Laboratories (New York), or the Illuminating Engineering Laboratories of the Edison Lamp Works (Harrison, N. J.), the National Lamp Works (Cleveland, Ohio), or the Westinghouse Lamp Works (New York).

If curves and data are submitted from any other laboratory than those just named, the acceptance of the ..... for the use of such data and curves must be obtained in writing before the bid is submitted, otherwise the offer will not be considered.

All units will be classified in accordance with a uniform rating card, which will rate the units from the standpoint of glare, light distribution, illumination efficiency, shadows, maintenance, fixture cost, and appearance.

Only glass or high-grade white porcelain enamel reflecting surfaces shall be used.

Samples of fixtures on which quotations are made, complete with canopies, hangers, etc., are to be delivered to the..... for inspection by the.....when requested without charge.

Sample fixtures of the semi-indirect type and others as may be required are to be hung and lighted for inspection and test by the..... .....and his assistants without charge. Where the removal of any of the present fixtures is necessary for the hanging of sample fixtures, the former shall be replaced in their original condition without charge.

Suggested Rating of Points — BASIS OF RATING LIGHTING UNITS FOR APPEARANCE

20 (a) Shape and attractiveness of fixture.

20 (b) Light striations and degree of uniformity of light distribution over fixture bowl. (Striations and non-uniformity-objectionable)

20 (c) Harsh shadows, light striations or bright spots on ceiling or walls. (All three or objectionable)

20 (d) Does fixture or lighting in room cause of depressing effect or a cheerful one? (Depressing effect is objectionable)

20 (e) Does fixture or lighting in room cause an irritating or annoying effect? (Irritation or annoyance is objectionable)

BASIS OF RATING LIGHTING UNITS FOR SHADOWS

Dense shadow objectionable. Soft shadows desirable. Use rating given typical lighting units in Edison Lighting Data Bulletin LD-117 D.

BASIS OF RATING LIGHTING UNITS FOR CLEANING AND LAMP MAINTENANCE*

10 (a) Weight of glassware. (Weight usually objectionable)

10 (b) Must globe be lowered to change lamp? (Lowering objectionable)

10 (c) Is globe self-supporting during relamping? (Lack of support objectionable)

10 (d) Is globe or reflector smooth on outside? (Roughness objectionable)

10 (e) Is globe or reflector covered? (Lack of cover objectionable)

10 (f) Slope of top or cover of unit. (Steep slope desirable)

10 (g) Can dust sift into unit from top? (Dust tight cover desirable)

10 (h) Does globe have breathing opening below? (Opening objectionable)

10 (i) Is unit rugged? (Ruggedness desirable)

10 (j) Is it difficult to get into unit to relamp? (Ease of relamping desirable)

*This represents only 50 per cent of maintenance rating. See "Dust Depreciation" column in the grading chart for the other 50 per cent.

GRADING CHART OF INDIRECT AND SEMI-INDIRECT LIGHTING UNITS FOR SCHOOL ROOMS

			COST	GLARE	LIGHT DISTRIBUTION	LUMEN OUTPUT	
Symbol	Numerical Value		Fixture Cost	C.P. Per Sq. In. of Brightest Part of Unit Ordinarily Seen	Ratio of Lumens in 90-180 deg. Zone to those in 0-90 deg. Zone	Of Fixture in % Fixture Lumens ÷ Lamp Lumens x100	DUST DEPRECIATION*
A+	95	Excellent	$ 7.50	.5	10.0	90.0	9.5
A	90	Excellent	10.00	1.0	6.0	87.5	10.0
A—	85	Very Good	12.50	1.5	4.0	85.0	10.6
B+	80	Very Good	15.00	2.0	3.0	82.5	11.7
B	75	Good	17.50	2.5	2.4	80.0	12.9
B—	70	Very Fair	20.00	3.0	2.0	77.5	14.25
C+	65	Very Fair	22.50	3.5	1.7	75.0	16.0
C	60	Fair	25.00	4.0	1.5	72.5	18.2
C—	55	Fair	27.50	4.5	1.3	70.0	22.5
D+	50	Conditional	30.00	5.0	1.2	67.5	25.0
D	45	Unsatisfactory	32.50	5.5	1.1	65.0	30.1
D—	40	Unsatisfactory	35.00	6.0	1.0	62.5	40.0

*Depreciation of light output due to deposit of dust. Test over 120 day period in dry dust location. I.E.S. Transactions, P. 58, Vol. XIX No. 1, January, 1924. As to maintenance, dust depreciation represents only 50 per cent; for the other 50 per cent see "Basis of Rating Lighting Units for Cleaning and Lamp Maintenance".

power. The unit is sold as a bright, cheerful unit and the sight meter is used to prove to the customer's own satisfaction that the efficiency is high. What the customer doesn't realize is that he is purchasing a glaring light source which will prove expensive in the long run. It is important that the utility's engineers be competent to detect these glaring deficiencies and combat their effects so far as possible.

In the past, illumination engineers have had no ready method for determining surface brightness in the field, but the handy little sight meter has made almost all things possible. By means of the simple device, suggested by the Electrical Testing Laboratories, reasonably accurate results may be obtained of the surface brightness of any lighting unit in the field, and a great deal may be done to combat the sale of glaring fixtures.

Take an ordinary mailing tube about 2¼ in. in diameter and line it with black velvet. Across one end, fasten a piece of black paper from which a circular opening 1.6 in. in diameter has been cut. The tube should be about 5.9 inches long, so that the distance from the surface measured to the light sensitive plate of the light meter is exactly 6 in.

Place the black paper end of the tube against the bright surface that is to be measured and the other end against the light sensitive plate of the light meter. The reading of the light meter in foot-candles divided by eight will give the brightness of the surface being measured in candle power per square inch.

Lighting of Large Rooms

In the lighting of large rooms where accounting or similar exacting work is being carried on, we are occasionally confronted with the complaint that there is too much light—that it hurts the eyes. This has occurred in cases where the new installation is of the indirect type. It would not be so surprising for a direct-lighting type. The illumination under the old installation had probably not exceeded 4 or 5 foot-candles, while the new installation boosted the illumination to 35 or 40 foot-candles where it ought to be.

What is the cause of complaint and is it real? One answer might be that the trouble is psychological; another that it might be due to the type and quantity of radiant energy emitted by the lamps. It is not due to too much illumination—that is certain. I work under from 50 to 70 foot-candles of illumination with no discomfort whatever and my eyes are particularly sensitive to light conditions.

Human nature instinctively reacts against changes which it does not originate. Again the eyes of the workers have been under a tremendous strain working under the old conditions. Suddenly that strain is released and the worker becomes eye-conscious. He realizes that his eyes hurt and although it is probably due to a long period of abuse, his reaction is that it must be the new lighting installation. The trouble has been remedied in some cases by very obviously reducing the wattage of the lamps, and then gradually and surreptiously replacing them with the larger lamps over a period of time. This usually works successfully.

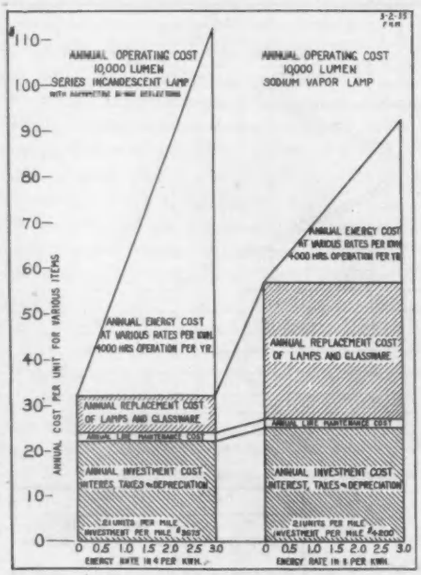


Fig. 5—Comparative costs for incandescent and sodium vapor lamps for highway lighting service

There is a suspicion on the part of some, however, that the cause may be due to the character of light emitted. It is known that Mazda lamps contain an excess of red and yellow rays in their spectrum, and red is exciting—irritating. Therefore they argue that in stepping up the intensity to the higher levels of illumination, enough excess of red rays is created to cause an irritating effect upon the eye. The replacement of the regular lamps with daylight lamps or the introduction of color filters has been effective in eliminating complaints.

At the present time, this matter is in the controversial stage and it is thrown in here to illustrate the kind of problems that confront the illumination engineer in his load building activities.

Highway Lighting

Much attention is being centered upon highway lighting because of the mounting toll of highway accidents. The number of accidents per vehicle mile is much greater after dark than during daylight, which indicates that lack of proper lighting is a direct factor in causing this increase. Such an assumption has been proved to be correct by the noticeable decrease in the accident rate on highways that have been properly lighted. Furthermore, adequate lighting enables the highways to handle more traffic with equal safety, in other words, it is equivalent to widening the highway for afterdark driving.

On this assumption, there is a belief on the part of some that proper highway lighting may be justified, not only on the basis of its ability to reduce accidents, but also because of its apparent ability to increase the traffic capacity after dark on existing roadways. One of the major deterrents to highway lighting in the past has been the feeling that its cost of maintenance and operation would be prohibitive.

With the advent of the sodium vapor lamp having almost double the lumen output per watt that the Mazda lamp can produce, it was easy to jump to the conclusion that the handicap of excessive costs might now be hurdled. It is not so easily solved, however, as that, for while the energy costs per unit are about half those for the Mazda lamp, the replacement and investment costs per unit are very much higher, and until the unit costs of the sodium lamp are materially decreased, it will be well to figure carefully each type of lighting before deciding on the unit to use. To illustrate this point, a typical study is shown (see Fig. 5).

There is little doubt, however, that a great deal of highway lighting will be installed in the next four or five years and that it offers a possibility for an appreciable amount of increased load having a long hour use.

Conclusion

In conclusion, I should like to say that I have presented these various problems to this group in order that you might see more clearly the field of the illumination expert. He is not fundamentally a salesman although he works in the commercial department; and he is a technical man or engineer although he does not work in the engineering department.

The illumination expert is perhaps more properly classified as a technical instructor or consultant. His prime function is to render illumination service to his employer's customers. He must keep this thought continually before him, and his success in loadbuilding will be a measure of the ability and care with which he handles the problems of these customers. Again I repeat, he should not be handicapped with loadbuilding quotas, for his ability and success as an illumination expert

decrease in direct proportion to his activities as a super-salesman. The two are not compatible.

The customer who has been shown the real value of improved illumination to himself, will be a satisfied and continuous user of service; the one who has been high-pressured into increased use of energy will be a spasmodic user and frequently a dissatisfied customer.

Progress Report of Wiring Sub-Committee*

By S. B. CLARK
Northwestern Electric Co.

IN the Northwest section during the the past year considerable progress has been made relative to the use of service entrance cable. Some of the utilities have used it quite extensively, while others, although desirous of doing so, have been prohibited by local electrical inspection. Several trial installations have been permitted by the inspectors in various communities, and the future use of service entrance cable in those places may depend somewhat upon the success of these trial jobs.

Interpretation of the National Electrical Code as to the usage of the protected and unprotected type of service entrance cables seems to differ in each locality where code is enforced. For example, in some sections, inspection follows the intent of National Electrical Code, in others, limitations are placed upon the full usage, which is a handicap in obtaining a complete economical service entrance installation. Other jurisdictions permit usage only of the so-labeled "protected type of cable"; and until a recent date, wire assembly enclosed within interlocking steel armor was the only protected type of cable manufactured. High cost made the use of this undesirable. It is obvious that a difference of opinion exists between inspection authorities in the different localities as to what constitutes an adequately armored or protected service entrance cable. It would seem reasonable that the National Electrical Code should be the controlling authority in order to give uniformity throughout the country.

A new cable of the protected type is now available known as type ASE and obtainable at a cost comparable to the so called "unprotected type." Scope of usage of both the protected and unprotected type, classified by the manufacturer as "armored" and "unarmored" service entrance cable will be widened by new rulings in the 1935 code in respect to allowing the usage of bare neutral service entrance cable in locations where continuous water piping systems are not available. The 1935 National Electrical Code will also allow the usage of the bare neutral service entrance cable between service equipment and range.

It is believed that the use of service entrance cable has potential possibilities from the standpoint of ease and installation, with resultant lowering of service entrance costs.

Practically all of the electrical utility companies have standardized on the outdoor socket type of meters installed ahead of the service switch. In this particular type of service entrance installation, service entrance cable has many advantages.

The development of service entrance cable in the future will be toward the elimination of certain styles and standardizing on the fewest possible types, which will no doubt considerably reduce manufacturing costs.

*A report of Utilization Committee, Engineering and Operation Section.

General Committee Reports† + + +

Accident Experience of Member Companies*

By J. D. ELLIS
Northwestern Electric Co.

THE 1934 accident statistics have been compiled under various classifications so that members may analyze more fully the various elements surrounding the accidents.

Probably the most important classification is the one dealing with "Causes." We have, in this classification, the material with which to build an effective accident prevention program for the future. It is interesting to note that of the 220 accidents occuring in 1934, one-third, or 77, have been a direct supervisory responsibility. Hazardous working conditions accounted for 15 accidents; defective tools and equipment for 9 accidents; absence of protective devices for 5 accidents, including 2 deaths; and the other causes listed make up the balance.

Employees were responsible for 116 accidents, causing a total of 49,993 days lost and accounting for 8 men losing their lives. Twenty-seven accidents were classed as unavoidable and accounted for 6,391 days lost; these accidents also included one fatal accident. Of the 116 accidents in which the employees were held responsible, 87 accidents were from carelessness and poor judgment.

These figures definitely mark the course we should pursue and indicate the bad spots that should be attacked and cleaned up first.

The "Occupational" classification shows, with further definiteness, where the working hazards lie. Transmission and distribution leads with 132 accidents—55,911 days lost and nine lives having been lost. Generation and transformation had 58 accidents—6,737 days lost, including one fatality. "General" totaled 30 accidents—6,659 days lost, including one fatality.

†J. B. Fisken, The Washington Water Power Co., Chairman; H. H. Schoolfield, Pacific Power & Light Co., Vice-Chairman on Codes; J. D. Ellis, Northwestern Electric Co., Vice-Chairman on Accident Prevention; G. E. Quinan, Puget Sound Power & Light Co., Vice-Chairman on Power Systems Engineering.

*A report of the Accident Prevention Subcommittee of the General Committee, Engineering and Operation Section.
J. D. Ellis, Northwestern Electric Co., Chairman; British Columbia Electric Railway Co., A. Vilstrup; The California Oregon Power Co., S. M. Bullis; Eastern Oregon Light & Power Co., B. F. Lentz; Grays Harbor Railway & Light Co., W. C. Kidder; Idaho Power Co., C. O. Crane; Mountain States Power Co., W. J. Mandley, Walter Smith; Pacific Power & Light Co., G. I. Drennan; Portland General Electric Co., E. D. Searing; Puget Sound Power & Light Co., R. S. Maxwell; Utah Power & Light Co., J. H. Sundstrom.

Linemen, groundmen, and troublemen experienced more mishaps that proved to be extremely severe than any other group of workers—seven men in these three occupations having lost their lives.

In the classification, "Nature of Accidents," 47 men fell from ladders, poles, etc., and 44 slipped or tripped and injured themselves. Seven deaths were caused from contacting electric circuits and 42,324 days were lost. Injuries from hand tools and flying particles and handling materials were rather numerous but not of a serious nature.

Bruises or contusions caused more workers to lose time than any other injury, but electric shock caused a greater

Table II—Accident Cause Classification for Twelve Companies Reporting, 1934

	Number of Accidents	Days Lost
I. Supervisory Responsibility		
A. Instructions		
1. Total absence of instructions or training	..	...
2. Erroneous instructions or training	1	1
3. Inadequate instruction or training	3	36
B. Discipline		
1. Lack of disciplinary rules and measures	..	...
2. Failure of enforcement	..	...
C. Working Practices		
1. Contributory negligence	4	135
2. Undue haste	..	...
3. Hazardous chances	4	133
4. Insufficient help	3	55
D. Working Conditions		
1. Improper storage of material	2	31
2. Congestion of passages and working areas	1	5
3. Poor illumination	..	...
4. False economy (sacrificing safety)	1	5
5. Hazardous working conditions	15	462½
E. Planning and Laying Out of Operations		
1. Defective design	..	...
2. Improper methods	7	114
F. Protective Devices		
1. Absence of protective devices	5	12,293
2. Poorly designed	3	73
3. Out of place	..	...
4. Not used	6	85½
5. Defective devices	1	30
G. Tools and Equipment		
1. Lack of proper tools and equipment	4	149
2. Defective tools and equipment	9	219½
3. Improper selection of tools	..	...
H. Buildings		
1. Hazardous structures	5	51½
2. Hazardous floors	2	44½
3. Hazardous stairs	..	...
4. Other building defects	1	3
II. Employee Responsibility		
A. Ability		
1. Incompetence	..	...
2. Inexperience	...	...
3. Carelessness	62	7,215½
4. Poor judgment	25	18,275
B. Mental and Physical Condition		
1. Mental unfitness	..	...
2. Physical unfitness	6	228½
3. Inattention	2	6,004½
4. Disobedience	..	...
5. Worry	..	...
6. Intemperance	..	...
C. Discipline		
1. Disobedience of rules and instruction	8	12,079
2. Chance taking	..	...
3. Playing	..	...
D. Miscellaneous		
1. Haste	4	31
2. Improper clothing or apparel	8	156
3. Carelessness of fellow employees	1	6,000
III. Unavoidable		
A. Matters beyond control of Employer or Employee	27	6,391
Total	220	70,307

Table I
Occupational Accident Classification for Personal Injuries 1930-1934

	Lost Time Accidents					Number of Days Lost				
	1930	1931	1932	1933	1934	1930	1931	1932	1933	1934
No. Companies Submitting Detailed Report	7	7	6	10	12	7	7	6	10	12
I. Generation & Transformation										
1.1 Const. & Maintenance										
1.11 Bldgs. & Structures										
1.111 Supervisors	..	..	..	..	1	..	..	..	..	73
1.112 Skilled Workers	18	..	..	4	3	137	..	..	50	55
1.113 Laborers	53	..	2	2	8	287	..	128	16	73½
1.12 Electrical Equip't.										
1.121 Supervisors	..	..	..	..	..	..	..	..	..	..
1.122 Skilled Workers	..	4	3	1	..	..	6,057	64	2	..
1.123 Laborers	..	..	..	..	..	..	..	..	..	..
1.13 Hydraulic Equipment										
1.131 Supervisors	..	..	..	..	2	..	..	..	..	6,003½
1.132 Skilled Workers	..	..	..	4	4	..	..	..	43	19
1.133 Laborers	..	..	..	..	14	..	..	..	..	204
1.14 Steam Equipment										
1.141 Supervisors	..	..	..	..	..	..	..	..	..	..
1.142 Skilled Workers	..	..	..	..	1	..	..	..	..	2
1.143 Laborers	..	..	..	..	2	..	..	..	..	20
1.15 Mechanical Equipt.										
1.151 Supervisors	..	..	..	..	..	..	..	..	..	..
1.152 Skilled Workers	..	..	..	..	1	..	..	..	..	2
1.153 Laborers	..	..	..	..	1	..	..	..	..	23
1.2 Operation										
1.21 Hydro Plant										
1.211 Supervisors	..	..	..	..	3	1	..	..	151	3½
1.212 Operators	3	..	4	5	..	18	..	6,040	3,067	..
1.213 Oilers	..	9	..	4	3	..	6,147	..	49	53½
1.214 Helpers	..	..	..	16	5	..	..	..	194	72
1.215 Flume Patrol'm	..	..	..	..	..	..	..	..	..	..
1.22 St'm & Diesel Plants										
1.221 Supervisors	..	1	..	..	..	..	6,000	..	..	..
1.222 Engin's & Oilers	..	..	4	..	2	..	..	84	..	27
1.223 Boiler Rm Oper's	..	12	..	4	1	..	4,422	..	78	32
1.224 Electrical Oper's	..	..	..	1	1	..	..	..	1	1
1.225 Helpers	4	..	..	2	..	207	..	..	19	..
1.226 Laborers	4	15	4	8	4	125	209	41	117	11
1.23 Substations										
1.231 Supervisors	..	..	..	..	1	..	..	..	..	15
1.232 Operators	..	..	..	3	2	..	..	..	57	11
1.233 Helpers	..	..	..	1	1	..	..	..	9	36
II. Transmission & Distribution										
2.1 Construction & Maintenance										
2.11 Overhead										
2.111 Supervisors	..	..	2	1	1	..	..	57	21	6,000
2.112 Linemen	67	55	26	27	70	15,315	25,950	2,471	11,034	31,869½
2.113 Groundmen	52	42	13	18	22	496	7,531	6,451	260	6,324½
2.114 Patrolmen (Maintenance)	6	..	..	3	..	60	..	..	18	..
2.115 Truck Drivers	..	..	..	..	6	..	..	..	..	115
2.12 Underground										
2.121 Supervisors	..	..	..	..	..	..	..	..	..	..
2.122 Cable Splicers	..	..	..	..	..	..	..	..	..	..
2.123 Wiremen	..	..	..	..	1	..	..	..	..	1½
2.124 Helpers	..	..	..	1	3	..	..	..	1	9
2.125 Laborers	29	7	..	3	1	316	3,599	..	88	11
2.126 Truck Drivers	..	..	..	..	..	..	..	..	..	..
2.2 Operation										
2.21 Overhead										
2.211 Supervisors	..	..	..	..	2	..	..	..	..	6,018
2.212 Inspectors	1	1	..	2	1	61	6,000	..	32	35
2.213 Patrolmen	..	..	..	3	4	..	..	..	61	43
2.22 Underground										
2.221 Supervisors	..	..	..	..	..	..	..	..	..	..
2.222 Inspectors	..	..	..	..	..	..	..	..	..	..
2.23 Service										
2.231 Supervisors	..	..	..	3	1	..	..	..	221	6
2.232 Meter Installers	..	..	3	4	3	..	..	6,159	54	7½
2.233 Instrument and Appliance Testers	..	..	..	..	1	..	..	..	..	28
2.234 Appli. Installers	..	..	..	3	2	..	..	..	9	13
2.235 Troublemen	..	7	4	8	13	..	6,069	183	75	6,428
2.236 Truck Drivers	..	..	..	..	1	..	..	..	..	2
III. General										
3.1 Stores & Storeyards										
3.11 Supervisors	..	..	..	1	..	..	..	..	5	..
3.12 Stores Employees	4	5	1	4	4	29	48	9	80	24
3.13 Repairmen	..	..	..	1	1	..	..	..	5	36
3.14 Truck Drivers	..	2	..	1	..	..	83	..	10	..
3.2 Transportation										
3.21 Supervisors	..	..	..	..	..	..	..	..	..	..
3.22 Garage Chauffeurs	..	..	..	..	..	..	..	..	..	..
3.23 Garage Mechanics	..	..	..	..	..	..	..	..	..	..
3.24 Mechan's Helpers	1	..	..	..	..	40	..	..	..	..
3.25 Truck Drivers	..	..	..	..	1	..	..	..	..	1
3.3 Engineers & Surveyors (Field)										
3.31 Supervisors	..	..	..	..	..	..	..	..	..	..
3.32 Engineers	..	..	..	..	..	..	..	..	..	..
3.33 Instrument Men	..	..	..	..	..	..	..	..	..	..
3.34 Chainmen & Stakemen	..	..	..	..	1	..	..	..	..	65
3.35 Laborers	1	3	..	..	..	54	43	..	..	..
3.36 Truck Drivers	..	..	..	..	..	..	..	..	..	..
3.4 Buildings (Other than Gen. & Transf.										
3.41 Supervisors	..	..	..	..	..	..	..	..	..	..
3.42 Skilled Workers	..	..	..	..	..	..	..	..	..	..
3.43 Laborers	..	..	..	..	4	..	..	..	..	112
3.5 Shops										
3.51 Supervisors	..	..	..	..	..	..	..	..	..	..
3.52 Skilled Workers	..	..	..	..	6	..	..	..	..	252½
3.53 Helpers	..	..	..	..	1	..	..	..	..	16
3.54 Laborers	..	..	..	..	..	..	..	..	..	..
3.6 Office										
3.61 Exec's & Supt's.	..	..	..	..	1	..	..	..	..	42
3.62 Engineers & Draftsmen	..	..	..	..	..	..	..	..	..	..
3.63 Accountants, Bookkeepers, Clerks and Stenographers	..	..	..	..	2	..	..	..	..	3½
3.64 Meter Readers, Bill Distributors, & Messengers	..	..	..	6	9	..	..	..	116	6,107
TOTAL	243	163	66	147	220	17,145	72,158	21,687	15,947	70,307

Table III—Nature of Accidents, Twelve Companies Reporting, 1934

		No. of Accidents	Days Lost
1.	Automobile or Other Vehicles	9	18,094
2.	Cave-In	..	...
3.	Corrosive and Poisonous Substances	1	8
4.	Dust and Flying Particles	11	82½
5.	Elements (Frost Bite, Sunstroke, Lighting, etc.)	1	8
6.	Explosion	2	19
7.	Fall of Persons—From Ladders	17	543
8.	Fall of Persons—From Poles	13	519½
9.	Fall of Persons—From Other Elevations	10	379
10.	Fall of Persons—Into Excavations	4	6,033
11.	Fall of Persons—Other Openings	..	...
12.	Fall of Persons—On Level Surfaces	3	87
13.	Falling Objects	3	82
14.	Fire	1	7
15.	Flash—Electric	12	108½
16.	Gaseous Surroundings	..	...
17.	Hand Tools in Hands of Injured Person	16	280
18.	Hand Tools in Hands of Fellow worker	5	40
19.	Hot Substances	2	28
20.	Insects and Animals	1	2
21.	Machine Tools Under Control of Injured Person	6	102½
22.	Machine Tools Under Control of Fellow Worker	..	...
23.	Moving Objects (Other Than Falling)	3	66
24.	Contact With Electric Circuit	14	42,324
25.	Slipping or Tripping Without Falling	44	819
26.	Steam and Steam Pipe	..	...
27.	Stepping on Sharp Objects	4	20
28.	Striking Against Other Objects	6	136
29.	Handling Materials	17	316½
30.	Assault	..	...
31.	Miscellaneous	15	202½
	Total	220	70,307

Table IV—Nature of Injury, Twelve Companies Reporting, 1934

		No. of Injuries	Days Lost
1.	Abrasions	11	195
2.	Amputations	1	23
3.	Gas Poisoning	..	...
4.	Burns	20	276½
5.	Contusions	38	781
6.	Concussions	1	29
7.	Cuts	16	226½
8.	Dislocations	1	6
9.	Fractures	24	19,262½
10.	Freezing or Frost Bite, Sunstroke, Heat Exhaustion	1	8
11.	Hernia	4	161
12.	Irritation	1	8
13.	Inflammation	3	76
14.	Lacerations	6	66
15.	Punctures	24	247½
16.	Shock—Electric	10	42,207
17.	Sprains	21	285½
18.	Scalds	..	...
19.	Strains	31	406
20.	Nervous Shock	..	...
21.	No objective signs of injury	2	6,035
22.	Foreign Body in Eye—No Complications	5	7½
	Total	220	70,307

Cases of multiple injuries were classified according to the most serious injury.

loss of time, of course, due to the fact that seven fatalities were charged to this injury. Strains, fractures, punctures, and burns were the other principal injuries. In many instances minor wounds that became infected caused quite a number of days lost. Proper attention of all these wounds at the time of injury would undoubtedly have reduced this figure.

Automobiles and other vehicles came in for more than their share of lost time, with 18,094 days. Three fatal automobile accidents accounted for practically all of these days and stamps the automobile as a hazardous vehicle that requires a great deal of good judgment and constant attention for safe operation.

A summary of accident experience of individual companies shows two companies having a perfect record for the year 1934. Examination of the yearly report shows a very decided upward jump of both frequency and severity rates as compared with the 1933 rates. The 1934 frequency rate is still considerably below the six-year average of 20.2, but the severity rate is practically the same. At the time of writing this report the national 1934 figures for public utilities have not been published, but it is probable that the frequency rate of 12.73 for our groups is about 50 per cent higher than the national figure will be, and the severity rate of 4.07 will be found to be better than twice the national rate.

Due to the fine cooperation that all companies have given in sending in their reports, we have been able to render the most complete and concise report in the history of the association. We have, in this report, a complete picture of our accident experience, and we should be able to map out a very effective campaign of accident prevention for the remainder of this year and for next—a campaign which will prove that accidents can be prevented by proper planning and execution.

Table V—Summary of 1934 Accident Experience

Key Number	Number Lost Time Accidents	Number Days Lost	Total No. Man-Hours Worked	Frequency Rate	Severity Rate	Fatal Accident
1	19	185	1,049,054	18.11	0.176	..
2	0	0	156,726	0.0	0.0	..
* 3	0	0	139,728	0.0	0.0	..
4	11	6,386	1,087,273	10.12	5.87	1
5	14	328½	1,028,442	13.61	0.32	..
6	11	53½	866,801	12.69	0.06	..
7	20	210	1,142,400	17.51	0.18	..
* 8	42	6,824	2,229,440	18.84	3.06	1
9	20	18,315	2,155,515	9.28	8.50	3
10	24	24,837	3,806,751	6.3	6.5	4
*11	38	6,769	2,682,602	14.16	2.52	1
*12	21	6,399	934,673	22.47	6.85	1
Total	220	70,307	17,279,405	12.73	4.07	11

*No report for 1933.

Table VI—Yearly Report—1929-1934

Year	Number of Companies	Number Lost Time Accidents	Number Days Lost	Total No. Man-Hours Worked	Frequency Rate	Severity Rate	Fatal Accidents	National Average for Public Utilities Frequency Rate	National Average for Public Utilities Severity Rate
1929	5	491	105,336	12,711,120	38.66	8.28	15	21.72	3.25
1930	7	473	81,970	13,997,736	33.80	5.85	12	16.55	2.81
1931	7	257	73,365	14,873,406	17.27	4.93	10	11.30	2.09
1932	8	117	22,759	12,457,170	9.39	1.82	3	9.82	1.83
1933	8	101	11,444	10,803,194	9.35	1.06	0	8.70	1.53
1934	12	220	70,307	17,279,405	12.73	4.07	11	..	..
Total for 6 Yr. Period		1,659	365,181	82,122,031	20.20	4.45	51	..	..

Discussion

G. E. Quinan, Puget Sound Power & Light Co.—This report renders a signal service to the electrical industry in the Northwest, since it gives a complete perspective of the situation which should enable any company to discover its weak spots and take steps to improve them.

John B. Fisken, The Washington Water Power Co.—The cost of accidents represents a large proportion of the cost of production and operation. Each company should study its own record and compare it with the records of others to see where it can cut its own costs.

Paul P. Ashworth, Utah Power & Light Co.—We have not taken the proper point of view in accident prevention work. We have emphasized physical factors such as safe-guards and safety devices. We have not paid enough attention to the human element. We need better supervision by foremen and supervisors. We should put the responsibility for accidents on these men.

R. S. Maxwell, Puget Sound Power & Light Co.—Every accident in the Puget Sound Power & Light Co. is investigated and judged by a jury of workmen. This jury, consisting of two men in the same kind of work as the injured person and the supervisor of the man injured, tries to fix responsibility for the accident and sets the penalty for the man responsible. There is a board of appeals consisting of three men who hear appeals from the decision of this jury after penalties have been fixed. The penalties imposed are time-off. There are no rewards given for not having accidents because accident-free work is presumed to be an essential part of of the job. The essence of this system is that the man is judged by his equals and not by white collar men from the office. Reports of these investigations are not published.

C. E. Tappan, Idaho Power Co.—This company issues every man on the line a safety card. These are printed in different colors for each year and the men

treasure these cards. If a man has had an accident, he is denied a card though he can appeal to the general safety committee to secure one if he thinks he was not at fault.

J. D. Ellis, Northwestern Electric Co.

Employees should be made to understand that safety is a part of the job, that if they do not work safely and jeopardize themselves and their fellow-workmen, they are not doing the job properly.

Hazards of Hay Derricks Contacting Electric Lines*

By GEO. I. DRENNAN
Pacific Power & Light Co.

IN preparing a report on hay derrick hazards and hazards from kindred equipment, I realize that there are different kinds of equipment creating the same character of hazard. I will stress the hay derrick hazard, as this equipment constitutes the principal hazard of this kind in the territory with which I am most familiar. There are upwards of 2,500 such derricks in the territory served by my company, and I know one locality where one can stand and count from 30 to 35 of these monsters standing with outstretched arm, waiting for the time when some farmer will attempt to pass them under or near a power line.

Reproduced herewith are photos of typical hay derricks of the type most commonly in use. You will note they are equipped with steel cables, and here lies the greatest hazard. Also the boom or horizontal arm will swing in a complete circle, and often a heavy wind will cause such swing, and the cables will extend outward a considerable distance. Both the vertical pole and braces have cleat steps nailed on for climbing, and if a line will not clear the top of the boom the common thing to do is to send a man up to lift the wires over. The three above mentioned operations cause most of the trouble. For a number of years we just expected accidents and we had plenty of them, so in 1932 it was decided to start a campaign to prevent the accidents, and I am pleased to report it has produced results.

First we designed a sign reading: "*Caution*—When moving derrick under electric lines, be sure boom is lowered, as contact with wires may mean disaster. *Cooperation will prevent accidents!*" We made this of rustproof material, to be fastened to the upright pole about 6 ft. from the ground with 4 drive screws. We then had our rural representatives call on every owner or occupant of a farm possessing a derrick, to explain our purpose, and in every case received full cooperation. We noted on the customer's card the fact that on such a date the derrick was posted, and also any comment the derrick owner made, favorable or otherwise. Another sign similar to the derrick sign but with different wording was used to post gates or crossings, but it was not used freely because there were not suitable places to mount them. A number were posted, however, and they may have done some good.

The next step was to send a form letter on May 30 to every derrick owner, as follows:

> Each harvest season some unfortunate accidents occur throughout the country caused by moving of hay derricks under electric power lines. The utility companies feel that all such accidents can be avoided if proper precautions are taken in the moving of such equipment under or near these lines.
>
> We are calling this matter to the attention of our customers, and others, in the hope that precautionary measures may be used to assist in this work. If a derrick or other piece of apparatus is to be moved, it should first be ascertained whether there will be sufficient clearance, of several feet, to allow it to pass under the line.
>
> Allowances should be made for the sudden throwing of the mast or boom due to rough ground. This unexpected throwing is often the cause of trouble. Special care should be taken in moving derricks of the tilting boom type to see that the boom is securely fastened in a horizontal position so that it cannot possibly become loosened and swing during the process of moving.
>
> Under no condition should the boom cables or ropes be held in the hands while crossing under wires, and never should anyone be allowed to climb the mast or boom for the purpose of lifting the wires over it. If there is any doubt as to the safety of moving a derrick under any of this company's lines, we will be glad to cooperate by sending competent men to assist you, if we can be notified a short time before it is planned to move the equipment.
>
> We feel certain that everyone will be interested in helping save a life by working with us in this safety campaign. Whether or not you are a derrick owner, a word of caution to others will be of material assistance.
>
> In addition to this letter which we are sending to all of our rural customers, we are attempting to post small metal signs on all derricks and fence gates cautioning owners and operators of the hazards of moving equipment under power lines.
>
> If your derrick has not already been posted we will consider it a favor if you will call our office and request that we do so in order that your employees will be entirely familiar with these hazards.
>
> Electricity is a valuable aid to man. It is not dangerous when properly handled. Good judgment and observance of fundamental rules regarding it will promote safety and prevent accidents.

This letter was signed by the district manager for the purpose of giving it a local interest. Inside of ten days we had plenty of calls and letters asking for signs on derricks that had been overlooked, and complimenting us on the work. At the same time the district manager contacted every Grange Master and had this letter read and discussed at Grange meetings and posted on the bulletin board. This created interest to the point that newspapers wrote articles and editorials. Some small advertisements completed the 1932 program. The result was that not a single accident occurred the following year, 1933. Another letter was sent on May 30, 1933, similar in wording to the previous year's letter, except for the inclusion of a new paragraph reading as follows:

> In addition there are two other sources of extreme hazard that we desire to call to your attention and ask your cooperation in their prevention. One is the tendency of children, especially small boys, to climb trees near power lines. The other is pulling pump rods or pipe from deep wells and permitting them to contact electric wires.

This was distributed about the same as the first one—to individual farmers, granges, and newspapers—and never missing an opportunity to spread the message. All employees were made familiar with the story. The result was that there were no accidents for 1933. In 1934 we felt too poor to spend any money and decided to take our chance that the signs and good work of the past two years would carry us over. But it failed and we had one fatal accident in the case of a new man in the community who brought a derrick from a far distance that was not posted. It appears, however, that this man's neighbor had discussed this subject only a few days before, so he was not wholly unaware. There are two types we must look out for—the man who does not know the danger, and the man who becomes so accustomed to the scenery that he becomes careless and has no thought of danger.

Kindred Hazardous Equipment

As this paper is supposed to cover kindred hazards, I enumerate these others as appearing most dangerous or frequent—radio aerials and poles, pulling pump rods from deep wells, and house moving. Portable pile drivers and portable well drilling machines have wood derricks and steel cables similar to the hay derrick, thereby carrying the same potential hazard in the flow of current to ground through the cable. The metal boom crane directly connected with ground will cause the line to kick out but seldom will cause a fatality.

Answers to a questionnaire sent to 15 member companies are summarized as follows:

Company No. 1—In 1931 one man

*A report of the Accident Prevention Sub-committee of the General Committee, Engineering and Operation Section.

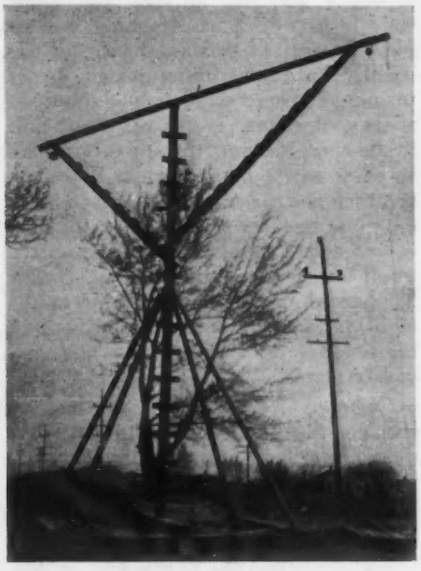


Fig. 1—One type of hay derrick which presents a hazard to power lines

was killed while a hay derrick was being taken under our 132,000-volt line. This was an extra high derrick and boom was lowered. The operators attempted to take this through at mid span, whereas in the field there was ample room closer to the towers. The man killed was walking behind holding a wire rope to steady the boom from side swinging.

Two accidents occurred in 1932: (1) Three men took a derrick under our 60,000-volt line without lowering the boom. One man was killed, another badly burned. Had the boom been lowered there would have been a 9-ft. clearance. (2) Two men attempted to take a derrick under an 11,000-volt line. They partially lowered the boom, but not enough to pass under the line. One of them was killed.

In 1933 two men were dragging a boom through a field alongside our 60,000-volt line. The boom was not lowered, and when they made a sharp turn away from the line, the high end, which was trailing behind, swung around into our 60,000-volt line. One team of horses was killed.

In 1934 two men attempted to drag a derrick under our 11,000-volt line at a point where there would have been sufficient clearance had they lowered the boom. They did not quite clear, and although the driver of the team was standing on the base of the derrick surrounded by ground cables, he was not hurt.

Two out of these five accidents have resulted in liability claims.

We have not made any serious effort to place warning signs on derricks, or to specifically warn individual derrick owners and users.

Company No. 2—The following are the hay derrick accidents that have happened on our system for the period of January 1, 1931, to December 31, 1934:

July 3, 1931—A reclamation employee drilling to test the water level. His augur had sections of pipe attached. In removing the augur he failed to remove each section and raised it into the 11-kv. line under which he was boring. Both hands burned severely with no serious results.

Aug. 15, 1931—Two farmers moving a hay derrick lowered the butt of the boom to pass under a telephone line and thereby raised the other end of the boom, contacting 66-kv. line which paralleled telephone line. One man had left hand and arm severely burned and the other suffered only slight burns on left hand and foot. A farmer was moving a hay derrick and in making a turn after crossing a bridge, the rope holding boom down broke and boom swung into 44-kv. line. Four horses were killed.

Aug. 20, 1931—A pipe pole supporting a radio antennae was being moved to the next yard by two men and two women. Two were holding a guy wire and when the pole was lifted out of the ground it got away from them and in falling contacted a 4-kv. primary in the alley. One man and one woman were killed and the other two shocked and slightly burned.

May 25, 1932—Barnes circus employees in erecting a tent pole shorted a primary line and damaged a regulator. No personal injuries.

June 10, 1932—A construction company moving a stiff-leg derrick over an irrigation bridge. The lunging horses tipped over the derrick, which contacted 11-kv. line, killing one horse and knocking down two men, who were not otherwise injured.

May 9, 1934—A farm hand was removing a cable from a hay derrick. This derrick had been used in well drilling near an 11-kv. line. When the cable was pulled through the pulley the end flew into the line. The man was killed.

Aug. 15, 1934—A farmer after having safely conducted a hay derrick under the line, turned in the field and the boom contacted 6,900-volt line. No casualties.

The preventative measures that we are using are as follows: A metal warning sign on each hay derrick; newspaper notices of danger in county weekly and semi-weekly newspapers; circulation of folders warning of hazard and requesting that derrick owner apply at nearest company office for assistance before taking derrick under line.

Company No. 3—The matter of hazards from hay derricks, pile drivers and other equipment contacting overhead power lines has always been with us. I might add to your list, house movers, steam and gas shovels, railroad cranes, sail and power boats and pile drivers and derricks mounted on scows.

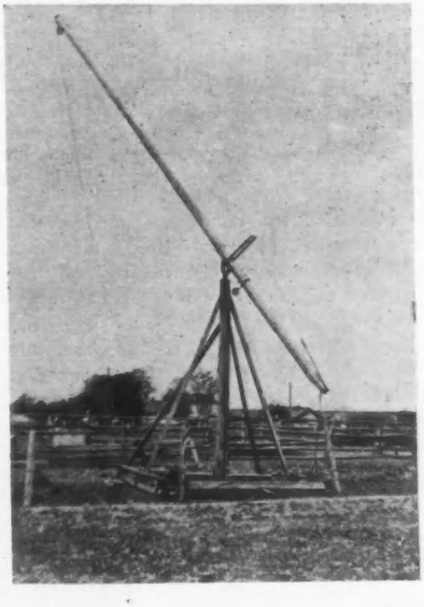
Within the past four years, we have had extensive damage to our power lines from a locomotive crane owned by the Commission of Public Docks. No personal injury resulted from these cases.

We have had a case of a pile driver mounted on a scow contacting a river crossing span at high water which tore down two wires of the span and was responsible indirectly for the death of one person.

In another instance, a contractor building a railroad crossing over the highway and using a boom derrick, contacted a high tension power line that was located on the railroad right-of-way, and burned down this line. No personal injury resulted.

As preventative measures, we endeavor to keep posted on contractor activities by reading advertisements and bid awards in the official publications of city, county, and state, and by general alertness of our line superintendents, foremen, and inspectors. We never have attempted to prepare bulletins and mail to all of the contractors, because of the impossibility of reaching all of them. Even when we take the care to warn contractors, it seems to be without effect, because in two out of the three cases above cited, this had been done and still the damage resulted.

Fig. 2—Swinging boom type of derrick with steel cables



Company No. 4—We have been particularly fortunate in having no serious accidents in recent years. However, as you know, we have done some work along this line, which probably has helped.

We have endeavored to contact the owners of portable derrick equipment in all territory served by us, and warn them of the hazard. We have also posted small enameled signs on all derricks of which we have knowledge, warning of the danger and asking that we be called whenever a derrick is to be moved near our lines. As a result we receive a number of phone calls each year and put a service man on the job at once to see that they do not get in trouble.

We used to raise wires over many gate crossings and road crossings, but we do not follow this practice to any great extent now. No doubt it has prevented some accidents, but it is too expensive to follow generally.

All this has resulted in cutting down the number and severity of accidents but it cannot prevent some green ranch hand from pulling a derrick out on the road and sailing down the road without ever looking to see if the derrick will clear, or trying to pull through anyhow, "because he didn't know it was dangerous."

Company No. 5—During the past four years, we have had three fatal accidents on our lines as follows:

June 27, 1932—One man was killed and a second man was badly injured while they were attempting to move a hay derrick under a 33-kv. line. A special high span on 40-ft. poles had previously been installed to permit the derrick to pass under the line, but the men permitted the horizontal arm to tip up so that the metal equipment on the top of the arm contacted the conductors. The man killed had hold of a cable which was in contact with the metal work on the end of the arm and was endeavoring to swing the arm around when the contact occurred.

June 1, 1933—An orchardist was engaged in pulling a 1½-in. waterpipe or pump rod from a well when it contacted a 13-kv. conductor and he was electrocuted. The man killed had passed the pipe through the opening and had carried the end to a door on the opposite side of the pump house from the line, which was 29 ft. 8 in. above the ground. This lowered the upper end of the pipe, which was 35 ft. 6 in. long, so that it came in contact with the conductor.

May 4, 1934—A crew of men was engaged in moving a log jammer along a patrol road close to a 60-kv. transmission line. The jammer consists of

Fig. 3—Warning sign posted on lines adjacent to gates

an upright boom held by a cross-tie member on a set of skids 14 ft. long, having a span of six feet. There is a ring on the boom at the top and two steel guy lines are attached to this ring. Two men were holding these cables as the jammer was pulled along by three teams. Reaching an elevated point in the road, the boom was thrown over towards the line so that the cables contacted the conductors. One of the two men holding the cables was electrocuted and the other was badly burned.

Company No. 6—There have been no accidents of this description in our territory for many years. There is no hay land in our immediate territory, and the only equipment that might cause similar accidents are pile drivers and well drilling equipment. There has been very little business of this description during the last few years.

Company No. 7—No report.

Company No. 8—The hazard of hay derricks and other high equipment contacting overhead power lines does not seem to be a problem with this company. We have had only one mishap of this nature in recent years, which was caused by a marine dredge working in a small waterway navigated ordinarily by tugs and scows only. Due to gross carelessness by the captain of the dredge, the boom was raised high enough to foul a 12,000-volt circuit crossing the waterway. The chance of such an accident recurring is remote, and we have taken no steps toward changing the conditions at this crossing.

Company No. 9—In this section of the country we have no extensive farming areas, and consequently the hay derrick is not a problem. We have pile drivers, steam shovels, ditch digging derricks, etc., and we are glad to report that we have never had any serious injuries from these machines, due to the close cooperation we get from the firms operating this type of equipment.

Many times it is necessary for us to de-energize our 4400-volt primary wires to allow the pile drivers and steam shovels to work. As we have a complete network of primary lines, this can usually be done without inconvenience to our customers. In our suburban areas contractors give us plenty of time to de-energize our transmission lines. In cases where this cannot be done the contractors are very careful not to work too close to these lines.

Our chief trouble has been from the small contractors who do not realize the hazard in coming too close to the high voltage lines, and from stump blasting operations by small contractors and farmers.

Company No. 10—We have had no accidents in connection with hay derricks and other similar equipment during the past four years.

Company No. 11—In 1931 three men were moving a derrick from one field to another across road, when one runner of drag sled dropped into ditch, causing boom to tilt, throwing end of arm higher, and contacting 6,600-volt line, killing man holding rope. The other man took hold of the cable to help him and was also killed.

In 1933 there were no accidents of this nature, but one boy was killed while attempting to string an aerial over a 6,600-volt line. No eye witnesses.

In 1934 there was one accident and one man killed. He was a new man in this community and had not been accustomed to power lines but was familiar with derricks, and his neighbor had discussed derrick hazards with him a few days previous. He was alone when discovered. The team had stopped and the derrick was in contact with 6,600-volt line. He had been dead about 30 minutes when found.

Company No. 12—The following accidents have occurred:

Oct. 22, 1932—Boom on crane was not lowered in passing under our lines and hooked the circuits, breaking and shorting the conductors and causing the oil switch at the substation on the 6,600-volt feeder to open.

Apr. 3, 1932—A customer's pumping plant is served by a 2,400-volt line, which crosses over the customer's canal. A tug boat entered this canal and the stack hit this 2,400-volt line, shorting it out. The fuse on one phase at the transformer bank flashed over, causing a fuse to blow on the primary side.

Mar. 20, 1934—Pile driver was being moved and accidentally swung into our line. They agreed to pay for all damages.

May 28, 1934—Crane on flat car, being used to load lumber on a construction job went through the line without lowering the boom, tearing and

burning two legs down. They will be billed for the cost of repair. The crane operator was new on the job, having just come to work, and he did not receive the proper warning about the wires.

Nov. 2, 1934—Crane ran into 6,600-volt line.

Date unknown—A contract company tore down secondary line with derrick used for loading rock into railroad cars.

The only thing that we do to prevent cranes and derricks running into our lines is to place metal signs on our transmission line poles warning the public about the high voltage wires and asking them to notify us in case they have any construction work in close proximity to our lines.

As to precautionary measures used by the reporting companies, at least two post all highline poles warning against high voltage dangers, either with metal signs or stencil. Summing up the accidents reported above: Hay derricks have caused fatalities to 4 men and 8 horses; well operation, 3 men; radio aerials, 3; and others, 1; besides many near fatalities, much suffering and a great loss of property. Can we not stop this killing? It would seem so. I think we have made fine progress, and I only hope this contribution will save a life or prevent an accident.

Accident Prevention in the Electrical Industry*

By JAY OLINGER

Supervisor of Safety Department of Labor and Industries, Olympia, Washington

NEW safety rules of the state of Washington (see report of Code Subcommittee) have been drawn up largely because of my pride in the electrical industry. This industry in which I have worked for many years has at times in the past established very satisfactory accident records, but recently these records have shown an upward trend of accidents as is indicated by the increase in state compensation insurance rates. The companies have been most cooperative in the framing of these new rules and this is appreciated. The rules will be ready for distribution in printed form shortly, and all companies are urged to place them in the hands of every workman and secure the signatures of these men stating that the rules have been received and read.

The small mutual companies and municipals are the worst offenders. The new rules are to apply to these companies equally with the larger private companies in the industry. In some cases the rules seem a little stringent, but we have tried to cover every situation and some times a rule has been inserted principally because of trouble experienced in one part of the state that does not generally apply to other parts of the state. It is believed that the rules will prove to be practical and workable.

I urge you to investigate all accidents, putting the foreman on the spot first. The state is going to investigate all fatal accidents and is going to find out in each case how much authority the foreman has over the men who work with him in his crew. Sometimes it is found that a man cannot work properly for one foreman but could work for another, and I urge you to straighten out any situation of this kind that might exist by shifting such a man to a foreman with whom he can work safely. A foreman should have complete authority over all who work in his crew if he is to be held responsible for accidents.

First aid training is one of the best features that can be introduced into a safety program. This is not only because it teaches men how to care for an injury, but also because it makes the men conscious of the possibility of accidents so that they are more apt to work safely. The presence of first aid kits on the ground is also a good preventive feature. In the first place it fosters the giving of attention to cuts and bruises to avoid infection thus minimizing the serious effect of accidents, and in the second place the presence of the kit is good psychology for the workmen. Artificial respiration is also important. Everyone in the crew should know how to apply this method. It has saved many lives after doctors have given up. Safety work generally has materially improved the relation between management and men.

The men should be made to stick to the safety rules and to rules referring to the use of protective devices. This is largely the foreman's responsibility.

It is interesting to note that city linemen generally are safer workers than linemen working in the country. This may be because a better type of workman is attracted to the city job. Fatal accidents last year were all in the country. I urge you to pick your country men with care. Get the best that you possibly can, because frequently such workman has greater responsibiilty through necessity of his having to work alone than the lineman who works on a crew in the city. District managers who have never had practical experience in line work should not be permitted to dictate entirely to the outside workers.

Investigation of accidents are best carried on in groups. Men will testify as to the conditions surrounding an accident when in a group, whereas they are reticent about giving all the facts individually to a department head or manager. I am not a believer in rewarding men for safety, but I do believe in penalties for causing or contributing to an accident. The Milwaukee Railroad came out of a very bad accident situation by the penalty method. Foremen were held responsible and where found to have had accidents in their gangs they were laid off for a certain time as a penalty. In a comparatively short period of time, accidents on this road were materially reduced.

The safety program the state is now putting into effect will have great benefits for the electrical industry. It will make men realize they are a part of the industry and not just hirelings. It will make safety programs put on by the power companies more effective and will create loyalty among the men. I want to emphasize that it is the human element that is important in safety work—a great deal more important than mere inspection of equipment and safety devices.

*A report of the Accident Prevention Subcommittee of the General Committee, Engineering and Operation Section.

Conclusions Drawn from 1934 Accident Experience

By J. D. ELLIS

"LET'S Quit Killing," a slogan adopted by the City of Portland in a drive to reduce fatalities on the streets and highways, may well be observed by our association during 1935. The responsibility in reducing the number of fatalities among the workers is inescapable, and, as men making a special study of safety problems, we are forced to assume a very large portion of this responsibility.

The records show eleven men killed during 1934, with a total exposure for all companies of 17 million man-hours. This averages one fatal accident for each 1,500,000 man-hours worked—a record that we, as a Safety Committee, surely cannot be proud of and which we should make every effort to prevent happening again.

A total of 220 lost-time accidents occurred during the past year, averaging one lost-time accident for every 78,000 man-hours of exposure. This figure also is too large and should be reduced by about one-third in order to come within the national average for utilities of our size. When reading over the reports handed in, there were several instances where accidents occurred that did not prove fatal, but it was only a kind providence that stepped in and spared the worker's life. In other words, the margin between the fatal and non-fatal accident was oftentimes very slight, and although some companies have been fortunate in not having a fatal accident, they have had mishaps that had all the potential possibilities of resulting fatally.

The same may be said of the non-lost-time accident, which has its counterpart in the lost-time accident. There is very little that separates the two, and, if any members are experiencing an abnormal number of non-lost-time mishaps, they will do well to take some preventive measure, because it is only a short jump to the lost-time accident, and another hop and we have 6,000 days charged against us for a fatality. By diligence in our efforts to prevent minor accidents we will go a long way in reducing the number of lost-time and fatal accidents.

As previously stated, the safety engineer can be held for only a portion of the total responsibility for accident prevention. The remainder must be apportioned between the management, supervisory staff and the workmen. Unless this line of responsibility can be kept intact and functioning continuously and effectively, unnecessary accidents with loss of time and life will inevitably result. If we have not definitely established this line in our individual organizations, we should do so at once. There needs to be more than a passive interest in accident prevention with the general manager's office. You will need authority to investigate and place responsibility for every accident occurring, as well as recommending and placing in operation the necessary remedial measures. A consciousness to work safely must prevail among the foremen and workers, and this is a direct responsibility of ours. If all these elements are established and function properly, our record next year will be one in which we can have considerable pride.

Report of Code Sub-Committee*

By H. H. SCHOOLFIELD

Chairman, Pacific Power & Light Co.

THE Code Sub-Committee has not been particularly active during the past year due to the absence of any revisions or amendments to existing codes which would affect member utilities. In fact it was not deemed necessary to appoint a regularly designated Code Sub-Committee, relying upon the fact that the chairman could call upon any member company organization for assistance in code matters if and when required.

It is deemed in order, however, that the chairman submit as a report a brief resume of activities relating to code matters that have transpired during the past year.

Washington Safety Rules for Electrical Workers

In August, 1934, a letter was sent out by Jay Olinger, Supervisor of Safety, of Washington, to all interested parties calling for a conference to be held in October at Olympia for the purpose of adopting state safety standards for the electrical industry. This matter received consideration by the Executive Committee of the Engineering and Operation Section at its meeting in Seattle in September, 1934, at which it was agreed that all member companies possible should be represented at the conference. It was also agreed that company delegates should act for their respective companies and not as members of an association committee.

The meeting at Olympia was conducted by Mr. Olinger, who at the outset appointed a voting committe of ten delegates, five to represent the power utilities, and five to represent labor organizations. After spending two days in discussion, it was moved and carried that Mr. Olinger as Supervisor of Safety, prepare a set of rules to be submitted to all interested parties for approval or rejection.

Complying with this motion, Mr. Olinger submitted in December, 1934, a draft of safety standards to be issued by the Department of Labor and Industries through the Division of Safety. This draft received careful consideration by the power utilities and at a conference held in January, 1935, by representatives of some of the larger utilities the draft submitted by Mr. Olinger was carefully reviewed, section by section, and a memorandum of suggested changes prepared. It was felt by the members at this conference that the rules as a whole were very well drawn and followed general safety practices now in effect by most of the larger utilities.

These suggested changes were presented to Mr. Olinger as representing the views of the utility group. As a result the final draft of the Safety Rules was submitted by Mr. Olinger to all interested parties in March, 1935, with the request for a definite vote of acceptance or rejection. The final draft contained practically all of the modifications and suggestions offered by the

*A report of the General Committee, Engineering and Operation Section.

utility group and has been accepted by at least a majority of the voting delegates and is now in the process of being printed for general distribution. As a whole they present a very workable set of rules which should result in fewer accidents to electrical workers if followed. Your committee recommends that each member company obtain a sufficient number of copies of these rules to have them widely distributed among the workers.

Oregon Electrical Workers Licensing Law

The 1935 Legislature of the State of Oregon passed an act, Chapter 318, amending the existing act and providing for the regulation of the installation of electrical apparatus and equipment for conveying electric current, adopting standards therefor, and providing for the registration and licensing of electrical contractors and workmen in the State of Oregon.

This act adopts the National Electrical Code, as now in effect and as from time to time amended and approved by the American Standards Association, as a standard under which all installations of wires and equipment to convey electric current, excepting communicating wires and apparatus, shall be made throughout the State of Oregon, except in incorporated cities having ordinances or building codes of their own. The jurisdiction for the enforcement of this act rests with the Commissioner of the Bureau of Labor.

On or before July 1, 1935, all persons or corporations conducting or carrying on a business of installing electric wires or apparatus, to be known as electrical contractors, are required to file an application with the Bureau of Labor and obtain a license before being permitted to install electric wiring or apparatus. The cost of such license is $20 annually for each place of business of the contractor.

On or before July 1, 1935, all journeyman electricians performing the work of installing electric wiring or apparatus, or one who supervises and directs such work, shall make application for a license and submit qualifications of experience and competence before being permitted to make such installations. Cost of a journeyman electrician's license is $5.00 for the first year and $3.00 per year for renewals. Persons installing apparatus or appliances belonging to public utilities are not required to be licensed. The licensing and registration portions of the act do not apply to persons or corporations engaged in the business of generating or selling electricity in connection with the generation, transformation, transmission or distribution from the source of supply to the service switch on the customer's premises.

Public utilities are not permitted to energize any installation, except in their own plants, unless the owner or a licensed contractor has attached a label indicating that such installation is in compliance with the code. The act does not apply to public utilities in connection with the installation or maintenance of metering apparatus, nor to street lights, nor to a person making an installation on his own premises.

The act provides for the registration of all persons or corporations engaged in the business of selling electrical equipment or supplies. Application for registration shall be filed before July 1 for each place of business in which electrical equipment or supplies are sold. The cost of this registration is $1.00 per annum.

The act provides for an inspection by deputies of the Bureau of Labor and gives the commissioner or his deputies the right to disconnect faulty or unsafe installations. The Commissioner of the Bureau of Labor is required under this act to make interpretations of the code, adopt rules and regulations and fix qualifications of applicants for a license as journeyman electricians. The latter shall be done by a board appointed by the commissioner consisting of at least five persons, which must include a licensed journeyman electrician, a licensed electrical contractor, a representative of the light and power industry, a representative of the fire underwriters and the Chief Electrical Inspector.

Violations of the provisions of the Act shall be deemed a misdemeanor punishable by a fine of not to exceed $100.00 or by 60 days imprisonment or both.

Washington Electrical Contractors Licensing Law

The 1935 Legislature of the State of Washington passed an act, Chapter 169, which was somewhat similar to the the Oregon act. Installations under this act are to be made in accordance with the National Electrical Code as approved by the American Standards Association and the National Electrical Safety Code as approved by the American Standards Association and other safety regulations having the American Standards Association approval. The jurisdiction for enforcement of this act rests with the Director of Labor and Industries of the State of Washington, and the new act repeals a somewhat similar act which was heretofore under the jurisdiction of the Fire Marshall's Department. After January 1, 1936, electrical contractors must obtain a license to conduct or carry on the business of installing electric wires or apparatus. The cost of such license is $50.00 per annum and shall be accompanied by a bond of $1,000.00 to be kept in full force and effect at all times.

The Washington act does not require licensing of journeyman electricians, nor does it require the application for registration to conduct a business for the sale of electrical appliances, as is required in Oregon. The Director of Labor and Industries, through a deputy inspector, is empowered to inspect all wiring and to disconnect such conductors or apparatus found to be dangerous or in an unsafe condition and not in accordance with the code. No wiring or equipment shall be concealed until inspection is made and the work approved. Public utilities are exempt from the license provisions with respect to the installation or maintenance of wires or apparatus for the transmission of electric energy from the source of supply and the point of contact at the premises. The act does not apply to installation or maintenance of service connections and meters on the premises of customers, nor in connection with street lighting, nor for the work of installing or maintaining apparatus used in public utility business.

An Electric Board of Appeals, if required for any decision under the act, shall be appointed by the Director of Labor and Industries, and shall consist of a representative of a public utility, a representative of an electrical contractor, a journeyman wireman and an electrical engineer, which four members shall elect the fifth. A decision made by the majority vote of the entire board on matters submitted to it shall be final and binding on all parties.

Violations of the act shall be deemed a misdemeanor punishable by a fine of not less than $50.00 or not less than five days imprisonment or both. Each day that any such violation shall continue shall be deemed a separate offense.

The above outlines the highlights of the acts passed by the Oregon and Washington legislatures regulating and licensing electrical installations. It is recommended by your committee that the employees of member companies thoroughly familiarize themselves with the provisions of these acts to determine wherein their companies are affected. It is also urged that member companies cooperate to the fullest extent with the governmental bureaus whose duty it is to enforce the provisions of the acts in order that the full benefits to be derived from having safe standards of electrical installations may be realized.

A summary of the 1935 revisions of the N.E.C., by S. B. Clark, is appended.

Revisions of 1935 National Electric Code*

By S. B. CLARK

Northwestern Electric Co.

Report is made only on those articles with which the utilities are mostly concerned.

Article 3—Outside Wiring

This article is rearranged and clarified as to scope. It will more generally cover outside wires on private premises and will apply to construction in public streets and alleys only in so far as necessary to facilitate the operations of fire departments and to regulate fire hazards due to exposure of adjacent buildings to overhead wiring.

Paragraph 301-a will be a new paragraph, making the general requirements of the code applicable to outside wiring.

Section 304 will be under a new title and will apply to "Overhead Wiring on Private Premises."

Article 4—Services

This article will be completely rearranged with the intent to clarify and will include a number of technical revisions.

Section 402—All the requirements on the low potential underground service construction have been collected in this section. Several items producing confusion heretofore have been stated in more detail.

Section 403—The present code deals with overhead service in three sections: from the main to the building, on exterior of building, and the service entrance. The new arrangement provides for two divisions only: from the main to the service head and from the service head to and including the service equipment. Most of the changes are for clarification or to recognize the need for protection in new type of service entrance cable recently approved.

Section 404—Service Heads to Service Equipment— (a) This paragraph as amended accepts service entrance cable without a service head where the end of the cable forms a gooseneck and is taped and painted.

(d) Note: (This is "e" in 1933 code.) The allowable use of a new uninsulated neutral service entrance conductor has been extended to secondary distribution systems "having at least one additional ground at the transformer or elsewhere."

(f) As amended, will permit a grounded service conductor of a smaller carrying capacity than the ungrounded conductor for size No. 6 and larger.

Section 405—(f) An enclosure for service switch and ungrounded device must have means for sealing.

Section 406—This section will authorize maintaining service over current devices inaccessible to the customer in the case of certain water heater circuits.

Section 407—Authorization to place meters ahead of service equipment has been further extended and current limitations are withdrawn. Sequences of over current devices—meter—switch, and meter—over current devices and switches are recognized.

Section 407 will read in part: "Section 407. Relative location of measuring and control apparatus and service equipment."

(a) The service switch or circuit breaker shall control all circuits and devices except the service fuses and the meter.

The over current protective device shall protect all circuits and devices except the service switch and, under the following conditions, the meter. (1) the supply shall be alternating current and not in excess of 300 volts. (2) There shall be no exposed wiring between meter and service equipment.

Note: There are three exceptions included to apply to 1 and 2. These exceptions are not given in the minutes of the meeting, but if there are no exceptions given on No. 2 the new code ruling is going to work a hardship upon the utilities. Resolutions should be passed in respect to the rule in No. 2.

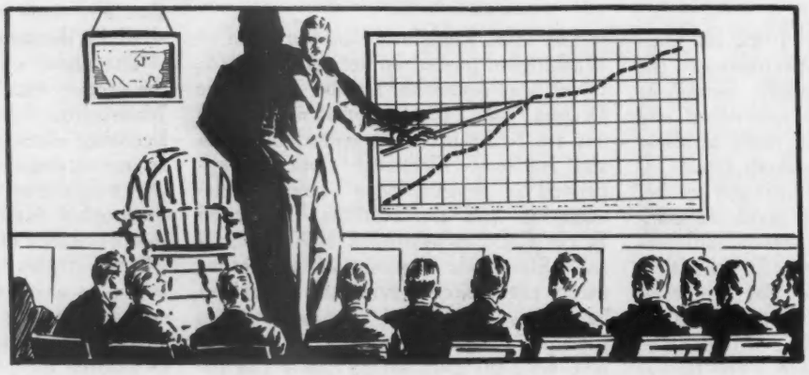
Article 5—Wiring Methods

Service entrance cable having a nonmetallic outer covering enclosing the conductor assembly and having an otherwise insulated grounded neutral conductor may be used within residences for a circuit supplying an electric range.

Article 9—Grounding

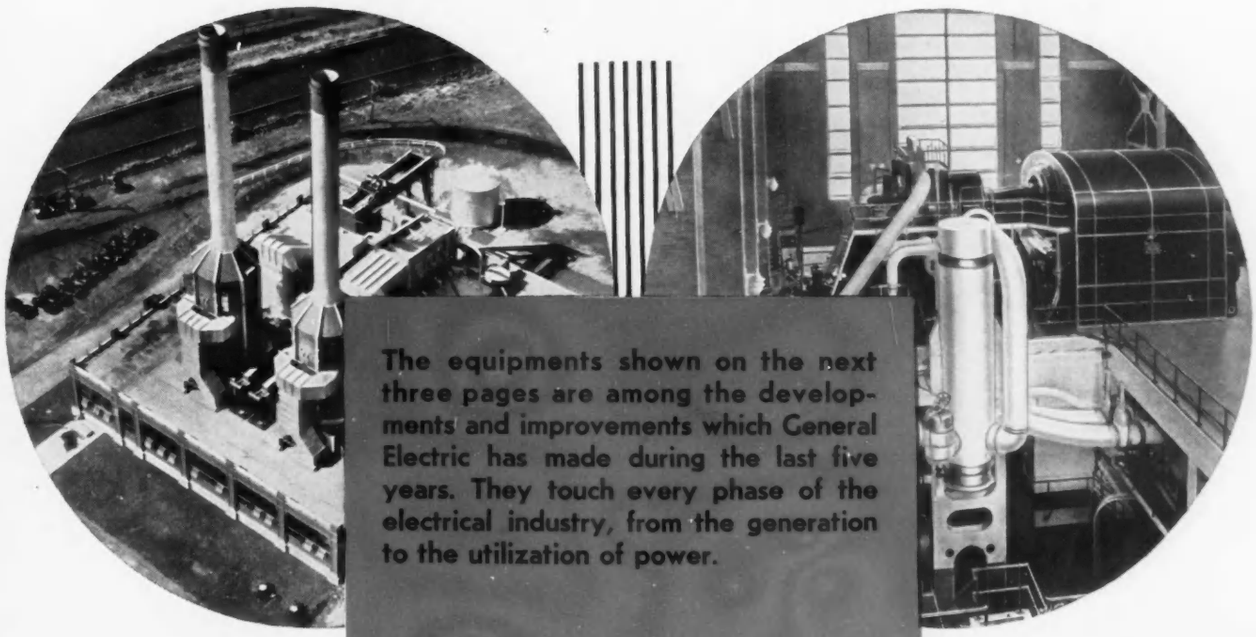
One section of quite some interest to the utilities is as follows: "On premises where continuous metallic water piping system is not available as a grounding electrode, and where it is not practical otherwise to secure a ground of permanently low resistance, the use of a wiring method which does not employ metal enclosure for the wires is recommended, unless the characteristics or occupancy of the building is such as to require the use of a metallic enclosure wiring system." This section was placed as a resolution and adopted.

*A report of the Code Sub-committee of the General Committee, Engineering and Operation Section.



GENERAL ELECTRIC

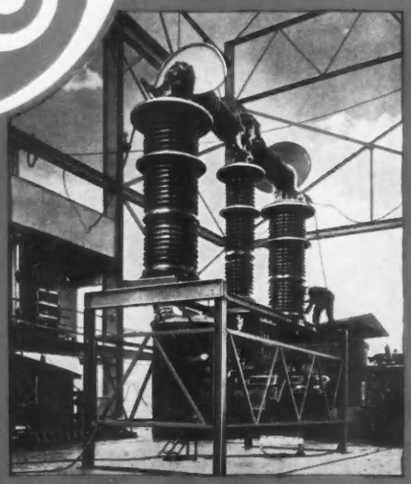
Is Ready with New Developments To Help Increase Operating Efficiency And Improve Customer Service



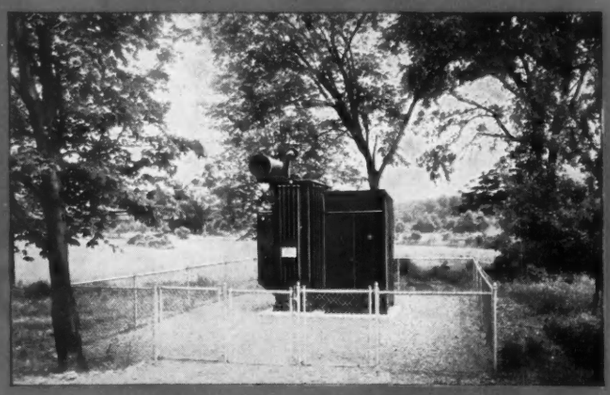
The equipments shown on the next three pages are among the developments and improvements which General Electric has made during the last five years. They touch every phase of the electrical industry, from the generation to the utilization of power.

GENERAL ELECTRIC OFFERS

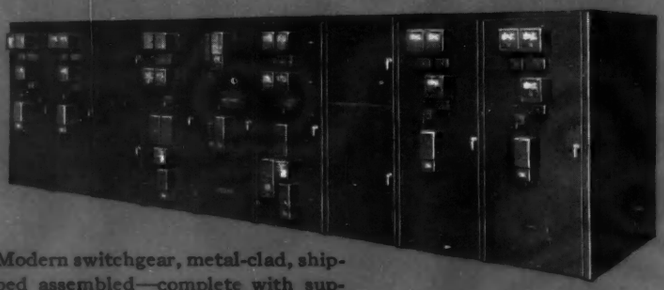
NEW DEVELOPMENTS



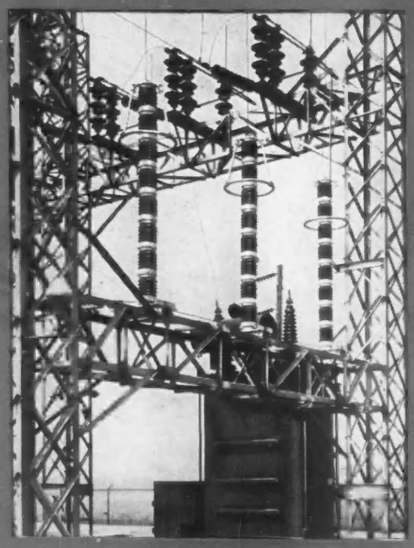
Impulse-type breaker (one pole illustrated)—remarkably high-speed, requires extremely small amount of oil. Twelve being built for Boulder Dam lines.



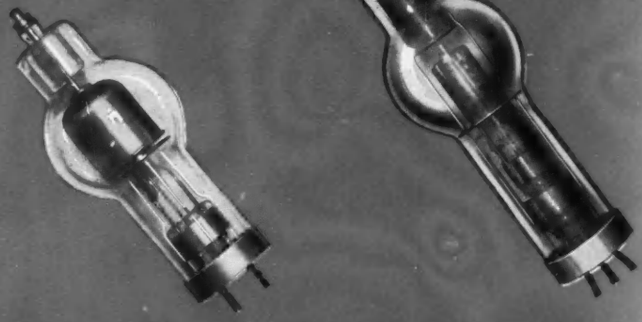
G-E unit distribution substation—adapted to primary networks and radial systems. Advantages—ease of installation, co-ordination of transformer and switchgear, reliability, and safety.



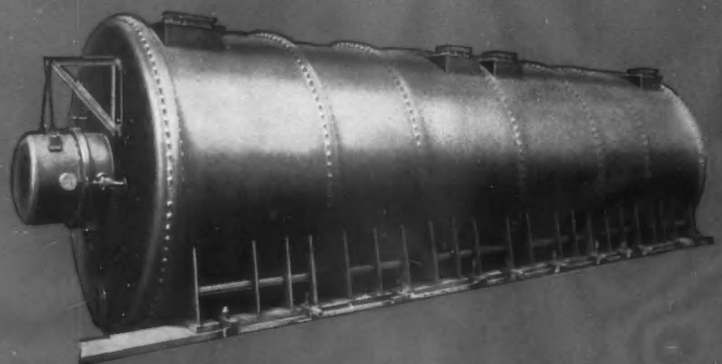
Modern switchgear, metal-clad, shipped assembled—complete with supporting structure, oil-blast breakers and elevating mechanisms, and all accessories.



Thyrite station-type lightning arrester—one type in complete G-E line of modern equipment for lightning protection from generator to meter.



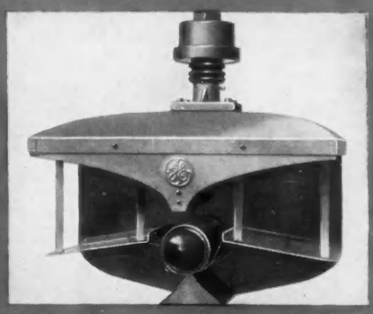
High-voltage Phanatron and Thyratron tubes—used in new G-E constant-current d-c. transmission that promises improvements in stability, reliability, and efficiency.



Hydrogen-cooled frequency changer (20,000-kw.). Saves substation cost by outdoor installation, increases efficiency, eliminates corona.

THAT WILL HELP YOU

IMPROVE OPERATING EFFICIENCIES



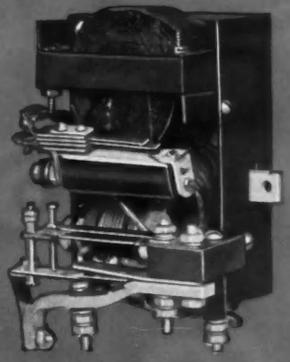
New, efficient, sodium-vapor highway luminaire. Thirteen important installations already operating.

New mercury-vapor lamp for street lighting.

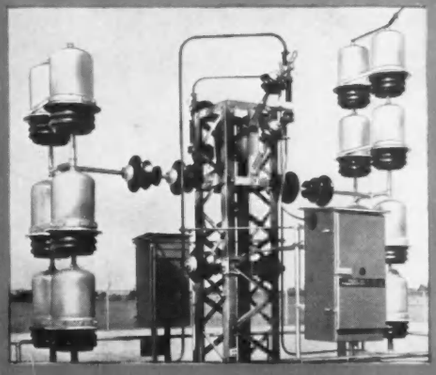
Capacitors for power-factor improvement, filled with nonflammable, nonexplosive Pyranol, smaller, lighter, and safer than oil-filled capacitors.

New types of cable—examples: Pyranol, Glyptal, and tellurium. Reduce costs and increase reliability.

Trend to meter standardization exemplified by G-E Type I-20. Long-range, long-time accuracy—dependable performance under all operating conditions.



Carrier control places all water heaters on each feeder under direct control of power operator. Result: improved load factor, regardless of shifts in peak-load periods.

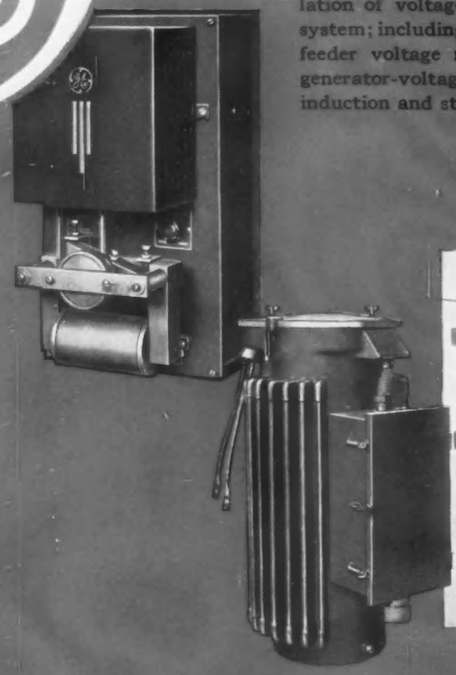


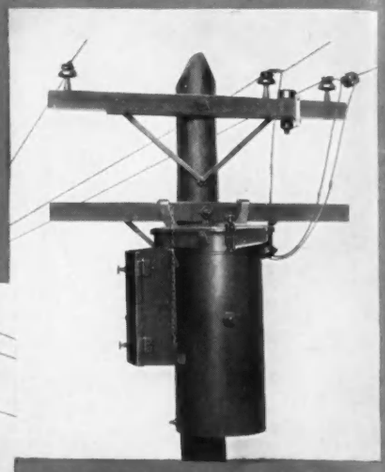
Carrier pilot relaying clears short circuits with greater selectivity and speed than any other form of single-line protection. Greater operating flexibility.

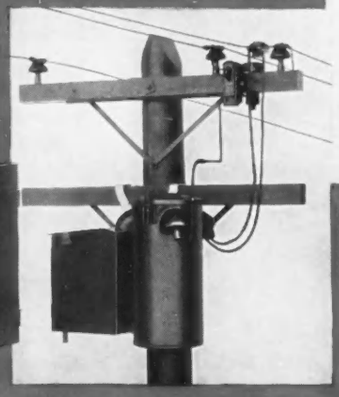
SOUND RECOVERY

THESE NEW DEVELOPMENTS HELP

Now, equipment for the economical regulation of voltage at every point on the system; including three new lines of branch-feeder voltage regulators, a new line of generator-voltage regulators, and improved induction and step voltage regulators.

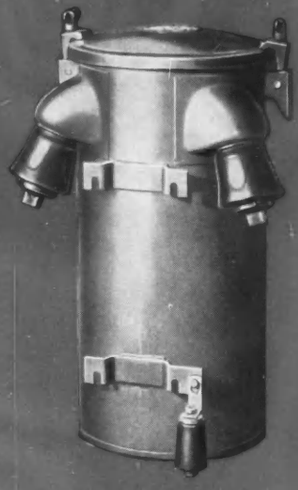






New 5-point code supervisory system—controls and indicates five remote switchgear units through one channel. Supervises machines and feeders, gives meter readings at desk.

Pole-mounted oil circuit recloser for protection of suburban branch and rural lines. Low in cost; reduces number and duration of service outages.



New G-E distribution transformer with self-contained lightning protection by true valve-type arresters. Reduces installation cost, improves service.

Enclosed indicating and drop-out fuse cutouts—indication by partial or by complete opening of the door. Features: ease of fuse renewal, safety, positive operation.

96-146

GENERAL ELECTRIC

News of Note + + +

Parker Dam Ruling Will Not Stop District

The United States Supreme Court ruling, which dismissed the government's suit to restrain the state of Arizona from interfering in the construction of Parker Dam on the Colorado River, will have no effect on Colorado River aqueduct construction by the Metropolitan Water District of Southern California, according to statements of district officials at Los Angeles, Calif., upon receipt of information on the court's decision.

Parker Dam is being built by the Federal government and its construction concerns the government and the state of Arizona. The district has an agreement with the Reclamation Service in the event Parker Dam is built to reimburse the government to a certain amount. Should the suspension of work on Parker Dam become permanent, the water district has plans for pumping its allotment of water directly out of the river and into the aqueduct line.

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California Legislature Approves Revenue Bonds

Both houses of the California Legislature have passed bills permitting the issuance of revenue bonds for engaging in all phases of the utility business. Each of the measures permits any governmental subdivision to organize a utility district by majority vote and subsequently to issue revenue bonds on the same basis.

AB 1165 passed the assembly by a vote of 55 to 23 in the state Senate. A somewhat similar measure passed by a vote of 31 to 4. Differences in the two bills will be ironed out in conference.

Amendments to require a two-thirds vote for the issuance of revenue bonds were defeated in both houses.

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San Diego Voters Defeat Revenue Bonds

Defeated by a vote of about 6 to 1 was a proposed charter amendment for the city of San Diego designed to create a Department of Water, Power and Sewage. The electorate turned it down at the election, April 23. Other propositions, Nos. 6, 7 and 8 were also aimed at all utilities serving the city and were so written as to ease the way for municipal ownership, particularly in the gas and electric field. They contained exceedingly rigid stipulations regarding granting of franchises which would have been confiscatory in character. These were defeated approximately 2 to 1.

No. 9 charter amendment included what was termed a revenue bond proposal which contained a joker. In case of failure of the revenue bonds to be self-supporting the bonds would have resolved into a lien upon general property. The power of bonding was to be transferred from the electorate to a board subsidiary to the City Council. Appeal to the voters was made on the basis of San Diego's allotment of water from the All-American Canal. The proposition would have made it mandatory to build a power line to San Diego for municipal distribution of that city's allotment of power from the canal system.

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Electric Cookery Gets National Advertising

Special impetus will be placed behind electric cookery by means of national advertising as a result of the recent meeting of the Range Section of the National Electrical Manufacturers Assn. Initial sales promotion will include a concerted consumer advertising campaign in the July issue of *McCall's* Magazine which is published on June 7. This action was influenced by reports indicating that range shipments for the first quarter of 1935 are 77 per cent ahead of shipments in the corresponding period last year.

A special advertising committee composed of W. A. Grove, Edison General Electric Appliance Co., Chicago; S. D. Mahan, Westinghouse Electric & Manufacturing Co., Mansfield and Walter S. Rowe, Estate Stove Co., has been appointed to work out additional details of the promotional campaign.

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• California Supreme Court on May 16 denied an application of the cities of South Gate and Huntington Park for a writ of prohibition to prevent construction of the 275,000-volt Boulder Dam transmission line through the cities by the Los Angeles Bureau of Power and Light. The right to construct the line was upheld in a decision of the Los Angeles Superior Court April 23. Attorneys for the two cities filed for a writ to prohibit execution of the decision. Property owners of the two cities first opposed the proposed construction of the power line in 1932, contending that the construction of the line would depreciate property values and prove a constant menace.

Repair Fire Damage With Relief Labor

A proposal to furnish labor from the relief rolls to repair damage caused by the recent fire at the municipally-owned, Lake Union steam plant in Seattle, thereby materially reducing cost of the work to the lighting department, has been made by A. M. Young, district engineer for the Washington Emergency Relief Administration to Mayor Charles L. Smith and Superintendent J. D. Ross.

Ross has asked the city council for a $33,000 appropriation to finance the needed repairs. The WERA would provide 65 per cent of the labor from the relief rolls, Young said, paying them the equivalent of what they would draw in direct relief. A major portion of the damage was done to the building proper, the loss in windows and steel sash alone, exceeding $5,000. Loss to machinery and apparatus was light and plant can be operated.

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Utilities Must Pay to Be Investigated

In a preliminary court test of the validity of a 1933 legislative act authorizing the department of public works to assess the cost of its statewide power, water and gas rate investigation against the utilities, the department of Washington state, at Olympia, on May 11, emerged victor.

Ruling on a suit brought by the department to recover costs of investigations from the Puget Sound Power & Light Co. and other utilities, Judge John M. Wilson, of Thurston county superior court, held the 1933 law to be constitutional in all respects. The fate of the department's entire program of utility rate and valuation investigations hinges on the eventual outcome of the case, authorities agree. Attorneys for the utilities said an appeal will be carried to the state supreme court.

Other utilities involved in the case are the Northwestern Electric Co., Interstate Power & Light Co., Winlock Water Co., Inc., and the Oregon-Washington Telephone Company.

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• July 28 has been set as the date for an election in Lindsay, Tulare and Corcoran on the question of forming the proposed Central Counties Municipal Utilities District for the distribution of natural gas. The pipe line and distribution systems would be financed by revenue bonds.

Discuss Increased Use at Northwest Conclave

Use of existing plants at a higher degree of efficiency was the keynote of the twelfth annual general meeting of the Engineering and Operation Section, Northwest Electric Light and Power Assn., at Seattle, Wash., May 9 to 11, 1935. This keynote was sounded by L. R. Coffin, Vice-President, Puget Sound Power & Light Co., who welcomed the delegates as president of the association, and many of the papers and discussions pointed toward this objective. Others bore on load building possibilities. The meeting was under the chairmanship of William S. Hill, Grays Harbor Railway & Light Co., and was attended by about 180 engineers from the five Northwest states of the association.

Papers and reports were presented during the first two days under four main committees: Production and Generation, J. E. Yates, Pacific Power & Light Co., chairman; Transmission and Distribution, T. A. Purton, Idaho Power Co., chairman; Utilization, Paul P. Ashworth, Utah Power & Light Co., chairman; and General Committee, J. B. Fisken, The Washington Water Power Co., chairman.

This group directs the activities of the Engineering Section of the Northwest Electric Light & Power Assn. From left to right they are Joe Hellenthal, Puget Sound Power & Light Co., the new chairman; W. S. Hill, Grays Harbor Railway & Light Co., the retiring chairman, and Tom Purton, Idaho Power Co., the new vice-chairman

L. T. Merwin, vice-president and general manager, Northwestern Electric Co., addressed the Friday morning session on the "Fundamental Premises on which Our Industry is Based." A spur to greater accident prevention activity was contributed in a talk by J. L. Olinger, supervisor of safety, Department of Labor and Industries, Olympia, Wash.

A paper by H. L. Melvin, Electric Bond & Share Company, read in his absence, discussed in general terms some of the factors involved in d.c. power transmission.

All the papers and discussions except those previously published in ELECTRICAL WEST are published in this issue in the supplement devoted to the reports of the Northwest Electric Light and Power Assn.

The last day of the meeting was devoted to inspection trips to points of interest on the system of the Puget Sound Power & Light Co., including hydro plants, automatic substations, a.c. underground systems, and electric steam boilers using existing surplus for generating steam heat for the company's steam heating business. George E. Quinan, Puget Sound Power & Light Co., headed the local committee on arrangements. At an executive committee meeting held between sessions the following were named to head the section activities for the coming year: J. Hellenthal, Puget Sound Power & Light Co., chairman, T. A. Purton, Idaho Power Co., vice-chairman.

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• DEMURRERS of the Southern California Edison Co., Ltd., to condemnation suits involving the company's distributing system in thirty-six outlying annexations to the city of Los Angeles, Calif., brought by the city and the municipal Department of Water and Power, were over-ruled in the county Superior Court on May 7. The suits seek to acquire by condemnation portions of the Edison Company's electrical distributing systems within the city boundaries not previously acquired by purchase. The initial proceedings in the suits were filed with the California Railroad Commission in 1925, 1926 and 1927. The company has been granted until Sept. 15 to file answers to the Superior Court actions.

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• MARKET STREET RAILWAY CO. of San Francisco, has ordered the first eight modern trolley coaches to go into service on the Pacific Coast. These 40-passenger vehicles will be equipped with Westinghouse current collectors arranged for wheel operation and four coaches will be powered with Westinghouse double type 65 hp. motors and variable automatic series parallel control. The motors are to be geared to the 10.5″ x 22″ dual rear tires to give the vehicle a balancing speed of 37 mph. on 600 volt power and level tangent roadway. A feature of the control on account of grades in San Francisco is the dynamic holding brake.

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GALVANIZED PRODUCTS

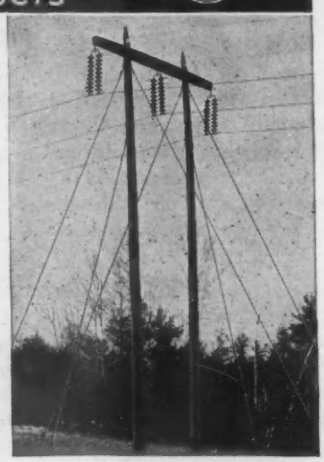
INDIANA STEEL & WIRE CO. Crapo Galvanizing MUNCIE IND

Specified by Leading Utilities Everywhere

The longer life and lower maintenance cost of *Crapo* Galvanized Steel Strand and Wire are matters of record with many of America's leading utilities. Time and again, these dependable products with their heavy, *pure* zinc galvanized coatings, have demonstrated their ability to resist corrosion far beyond the normal period of replacement.

That is one of the reasons why utilities from Maine to California now specify *Crapo* Galvanized Products on all new and replacement work.

Indiana Steel & Wire Co.
Muncie, Indiana



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Steel Strand

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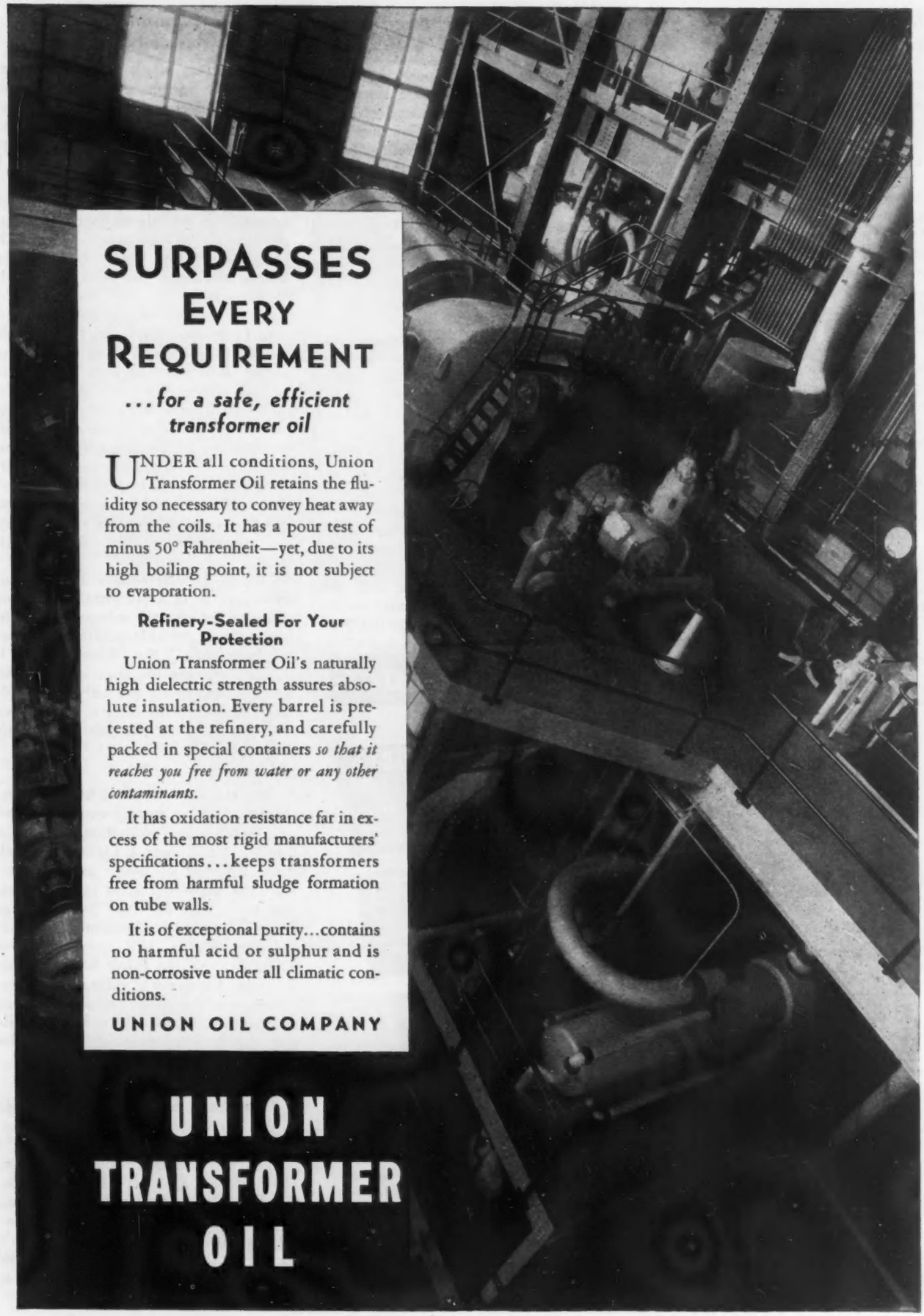
Telephone and Telegraph Wire

Typical installation of Cumberland County Power and Light Co., Portland, Maine. *Crapo* Galvanized Seven Wire Steel Strand used for guying.


SURPASSES
EVERY
REQUIREMENT
...for a safe, efficient transformer oil
UNDER all conditions, Union Transformer Oil retains the fluidity so necessary to convey heat away from the coils. It has a pour test of minus 50° Fahrenheit—yet, due to its high boiling point, it is not subject to evaporation.
Refinery-Sealed For Your Protection
Union Transformer Oil's naturally high dielectric strength assures absolute insulation. Every barrel is pretested at the refinery, and carefully packed in special containers so that it reaches you free from water or any other contaminants.
It has oxidation resistance far in excess of the most rigid manufacturers' specifications...keeps transformers free from harmful sludge formation on tube walls.
It is of exceptional purity...contains no harmful acid or sulphur and is non-corrosive under all climatic conditions.
UNION OIL COMPANY
UNION
TRANSFORMER
OIL

Pepco Financial Reorganization Assured

A milestone in the financial reorganization of Portland Electric Power Co. and its chief subsidiary, Portland General Electric Co., was passed early in May when 85 per cent of the holders of the first and refunding 4½ per cent mortgage bonds of Portland General Electric Co. had granted permission to the company to seek extension of $6,000,000 of a senior issue of 5 per cent bonds due July 1 this year. Under the trust indenture of the 4½ per cent debentures no extension of security date of previous issues could be made without consent of the bondholders.

Last Fall, Portland General Electric Co. realizing the impossibility of paying the 5 per cent issue on maturity on July 1, and of the extreme difficulty of refinancing these bonds by any new loan, asked the holders of the 4½ per cent debentures for their waiver of the trust provision referred to above and consent to the seeking of an extension on the prior lien 5 per cent bonds. By provision of the mortgage covering the 4½ per cent issue, agreement of 85 per cent of the outstanding face value of the issue was required to permit such procedure.

A letter has now gone out to holders of the 5 per cent bonds of 1935 asking for an extension of 15 years on the maturity date. The same interest is to apply for the extended period, and the bonds are to maintain their same relative position in the financial structure of the company. In addition, new sinking fund provisions will retire the entire issue by the end of the 15 year extension period.

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• NEW ISSUE of $73,000,000 Southern California Edison Co., Ltd., refunding mortgage gold bonds, series of 3¾s, due 1960, which is the largest single issue thus far registered under the Securities Act of 1933, was placed on the market April 24 by a nation-wide banking syndicate headed by The First Boston Corp. The bonds are being offered to investors at 98½ carrying interest from July 1. The proceeds of the issue will be used in part to retire the outstanding $13,360,000 general mortgage 5 per cent gold bonds, due 1939, and $55,000,000 refunding mortgage gold bonds, series of 5s, due 1951, which have been called for redemption at 105 and accrued interest on July 1, 1935. The retirement of the 5 per cent bonds and their replacement by the 3¾s now offered, will result in an annual interest saving to the company of $450,000.

Hotpoint Announces Record Range Sales

The largest single week's shipments of electric ranges and water heaters since 1929 were made the second week in May by the Edison General Electric Appliance Company of Chicago, according to an announcement by Pierre L. Miles, sales manager.

Orders received for Hotpoint ranges are 44.2 per cent ahead for the first four months of 1935 as compared with the same period last year. Water heater orders are 186.8 per cent ahead, Mr. Miles reports.

An aggressive year-round sales program, instituted this year, to "help the utilities to sell", plus a rapidly growing public acceptance of electricity as the modern cooking fuel are responsible for the encounraging sales results recorded so far, Mr. Miles believes. Faced with the necessity of increasing domestic consumption of electrical power, utility companies throughout the country have accepted the electric range as the most effective medium for this purpose and are concentrating their sales efforts on it.

"We confidently believe that the electric range is in a comparable position today to the electric refrigerator at the beginning of its wide public acceptance ten years ago," Mr. Miles says. "If this is true, then the sales increases being recorded today are only a prelude to a "boom" in the electric range business beyond even our most optimistic predictions."

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• SEATTLE CITY COUNCIL utilities committee is taking steps toward purchasing three power substations from the Puget Sound Power & Light Co. which furnish part of the power used in operating the municipal street railway lines. The price will be fixed by three appraisers but city councilmen estimate the transactions will involve about $200,000. All the Puget Sound Power & Light Company's substations, connected with the street railway, were to be taken over gradually under the railway purchase contract of 1919. The others have been bought.

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• NINE FIRMS submitted identical bids to the Tacoma, Wash., Board of Contracts and Awards for furnishing 45,000 pounds of weatherproof copper wire. The bids, $7,066, were handed in by the U. S. Rubber Co., Love Electric Co., General Electric Supply Co., Graybar Electric Co., John S. Roeblings Son's Co., General Cable Corporation, North Coast Electric Co. and Hunt & Mottet Co.

★ ★ ★ A 3-STAR PRODUCT
CRYSTALITE PRODUCTS CORPORATION
The West's only manufacturer of all types of Illuminating Glassware and Glass Specialties. Glendale, Calif.
LEONARD R. FOSS STUDIOS, INC.
Highest quality Parchment Shades. Standard — or made to specifications. Address: Oakland, California.
LUMIDOR MFG. CO.
Leading manufacturer of direct-indirect floor or student lamps. Standard — or made to specifications. Address: Alhambra, California.
Power Companies! Distributors! Dealers!
Here is a new, 3-star line. Our 1935 Lumidor floor and student lamps. Fast-moving, wattage-building, profit-making Type S1-2 Student Lamp illustrated. Several territories open. Wire or write for full details and specifications.
Lumidor Manufacturing Co. Inc., Alhambra, Cal.
All Products Approved I. E. S.—1935
LUMIDOR MFG. CO.

Monel Metal MAKES Water Heaters

SAFE FOR SELLERS

★ ★ ★

Takes corrosion risk out of Rentals and Long Term Payments . . . new models are equipped with tanks Guaranteed 20 Years

• *Babies will grow into boyhood, into manhood,* BECOME VOTERS, *before the guarantee on a Monel Metal tank "runs out." Yet our engineers tell us the tank itself is many times better than its guarantee.*

• *Tank-generated rust will never cloud the water from these heaters. A Monel Metal tank simply cannot rust.*

● Treasurers who have wondered what rust and corrosion might do to rental and easy payment plans can again rest easy. For with the new models, rust and corrosion are out of the picture. Their Monel Metal tanks can *never* rust. Attacks by the most actively corrosive water come to nothing when they meet the resistance of this nickel-copper alloy.

Whitehead* welded Monel Metal tanks are guaranteed for 20 years. Exhaustive engineering tests indicate a life many times that long under severe service conditions.

WESIX, HOTPOINT, WESTINGHOUSE all make Monel Metal models, and so each offers an appliance that can be sold with safety on the most sales-impelling terms. An appliance that will outlive the longest-running contract any purchaser would care to sign. An appliance that gives water heater financing a sound foundation.

That's the kind of appliance that builds enduring good will among customers . . . and the kind that it's a real pleasure to sell.

*Reg. U. S. Pat. Off.

THE INTERNATIONAL NICKEL COMPANY, INC.
67 WALL STREET NEW YORK, N. Y.

MONEL METAL

Monel Metal is a registered trade-mark applied to an alloy containing approximately two-thirds Nickel and one-third copper. Monel Metal is mined, smelted, refined, rolled and marketed solely by International Nickel.

SEND US

your recalibration work and save several weeks' time

Perhaps you, too, have on hand a number of old Bristol's Recorders that now, after a long period of fine service, need re-conditioning. Or that should be modernized in order to measure temperatures or pressures under the different conditions and within the different ranges your processes today require.

If so, send them direct to us. Don't think of going to the expense and delay of having this work done several thousand miles away.

Just pack recorders carefully and ship to 311 Minna St., San Francisco. Also, mail order authorizing work to nearest branch office.

Bristol's West Coast Service Laboratory and Assembly Plant

THE BRISTOL COMPANY

Branch Offices: Rialto Bldg., San Francisco
747 Warehouse St., Los Angeles
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TRADE MARK

BRISTOL'S

REG. U. S. PAT. OFF.

Power Bureau Budgets Approved for New Year

Annual budgets of the Los Angeles, Calif., Bureau of Power and Light and Bureau of Water Works and Supply totaling $63,962,300, for the fiscal year beginning July 1, were approved May 21 by the board of water and power commissioners. The Bureau of Power and Light budget as submitted by E. F. Scattergood, chief electrical engineer and general manager of the Bureau, amounts to $44,068,000. Of this amount the sum of $10,550,000 is to be applied to the power transmission reserve fund for the construction of the Boulder Dam transmission line; $1,234,500 to the Reconstruction Finance Corporation power notes reserve fund and $2,150,000 as payment to funds created pursuant to loan contracts.

Members of the water and power commission and heads of the two bureaus recently agreed upon the transfer of $2,559,945 to the city's general fund during the fiscal year to aid in balancing the general municipal budget. Duplicating the amount of power revenue funds transferred last year to the general city fund, $1,250,000 power revenue will be transferred to the reserve fund of the city during 1935-36. Of that amount $485,000 will go for direct relief and $765,000 will be used for payment of lighting services rendered tax-supported city departments.

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• BACK NUMBERS NEEDED.—So insistent has been a demand for certain back numbers of ELECTRICAL WEST that the editors appeal to its readers for assistance. If you have no further need for your December, 1934, February and March, 1935, numbers of ELECTRICAL WEST, we would appreciate having them. Drop us a note and we will forward postage to cover the cost of mailing to us.

•

• SAN DIEGO CONSOLIDATED Gas and Electric Co. has been authorized by the Railroad Commission to issue $15,500,000 first mortgage 4 per cent bonds, which are to be sold to net the company not less than 95 per cent of their face value plus accrued interest. The proceeds will be used to retire outstanding bond issues, bearing 5 per cent, 5½ per cent and 6 per cent interest.

•

• ELECTRIC RATES in Flagstaff, Winslow and Holbrook, Ariz., have been reduced as the result of an order by the Arizona State Corporation Commission. The reductions cover domestic and commercial rates and aggregate $15,125 annually.

• SANTA ANA, CALIF., adopted the Standard Electrical Code of the Pacific Coast Electrical Bureau. It went into effect April 1.

CHROMALOX

Replacement Range Units

build load for power companies, by making electric cooking simpler, cleaner, quicker—and build profits for dealers by selling themselves on the first demonstration.

Write us for full details and the sales campaign.

EDWIN L. WIEGAND CO.
PITTSBURGH, PA.

Represented by

MONTGOMERY BROTHERS
911 Western Ave., Seattle, Wash.
524 S. W. Pine St., Portland, Ore.
61 Fremont St., San Francisco, Calif.
912 E. 3rd St., Los Angeles, Calif.

THE PETERSON COMPANY
1921 Blake St., Denver, Colo.

PROFESSIONAL SERVICES

BYLLESBY
ENGINEERING & MANAGEMENT CORPORATION
Wholly-owned Subsidiary of
Standard Gas and Electric Company
231 South LaSalle Street, Chicago
New York Pittsburgh San Francisco

ELECTRICAL TESTING LABORATORIES
Electrical Photometrical, Chemical and Mechanical Tests. Inspection of Materials and Apparatus at Manufactory
80th St. and East End Ave., New York

ARTHUR R. KELLEY
CONSULTING ENGINEER
Reports and Valuations, Public Utility Industrial Properties
Edison Bldg. Los Angeles

Westinghouse MAGNALUX

Setting new sales records every month

★ Westinghouse Magnalux has rapidly proved the overwhelming choice in modern lighting. With efficiency as high as ninety per cent, this semi-indirect luminaire provides stores, shops, offices and homes the ultimate in glareless, shadowless, eye comfort illumination.

A demonstration creates immediate desire for modern illumination. One installation sells another. Here is a *real* load-builder . . . and it is backed by the most complete merchandising plan in the lighting industry. Ask for details. Westinghouse Electric & Manufacturing Co., Lighting Division, Edgewater Park, Cleveland, Ohio.

Los Angeles Housing Show Electric Homes Shown at

Called a National Housing Exposition is the big exposition of home building and modernization which opened May 18 in Los Angeles on an extensive site at Beverly Blvd. near Fairfax Ave. The electrical exhibits in this exposition were a result of fine team work on the part of the industry in southern California. The Southern California Edison Co. and Bureau of Power and Light of the city of Los Angeles combined to obtain at the special rate for large space a 3,000-sq. ft. exhibit area which was subdivided and provided to exhibitors in the industry at a low cost of 75 cents per sq. ft. In the center of this exhibit was a large reproduction, 63 ft. long, 22½ ft. high and 12 ft. deep, of Boulder Dam.

A committee was appointed, consisting of Henry C. Rice, merchandising manager of the Southern California Edison Co.; A. W. Elliott, assistant business agent, Bureau of Power and Light; Fred C. Todt, General Electric Supply Corp.; J. A. Duncan, Westinghouse Electric Supply Corp., and Victor W. Hartley, managing director, Pacific Coast Electrical Bureau, chairman. This committee provided for the subletting of the space, which was laid out in uniform designs of booth and surmounted by a 2-ft. high transparent silhouette sign, 10 ft. above the ground, carrying this message: "Electricity — The Magic of the Modern Home—Electricity."

Exhibitors which had signed up to participate at the time of going to press included Listenwalter & Gough, Frigidaire Sales Corp., Solar Lite, Watson & Wilson, Leo J. Meyberg Co., Stewart Warner, Thermador Electric Manufacturing Co., Chicago Flexible Shaft Co. and Sears, Roebuck & Co. By this subletting means space which would have cost exhibitors as much as $2 per sq. ft. was provided at the low cost of 75 cents per sq. ft.

The exposition, begun on May 18, was scheduled to run sixteen days but will be continued longer if the attendance keeps up satisfactorily.

Outside of the main exposition building, which covers 100,000 sq. ft., several model homes have been put up by department stores, newspapers and others to exhibit everything that goes into home construction and home furnishing. Many of these are completely electrically equipped so that the visitors to the fair will have every opportunity of seeing electricity under modern living conditions. Dealers in the southern California area took advantage and will continue to take advantage of the exhibitions made at the fair. The advertising value of this will be felt for many months to come.

•

• AIR CONDITIONING—The first large, complete air conditioning installation in the San Francisco Bay area is being installed in the Alameda Court House, Alameda, California. The air conditioning equipment for properly controlling the temperature and humidity during both winter and summer will be so arranged that the heating, cooling, and humidity may be controlled independently in each of the thirteen court rooms. The contract for the equipment was awarded to the Edward B. Ward and Co., Westinghouse air conditioning dealer.

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• ORGANIZATION of the Southern San Joaquin Valley Municipal Utility District, including the towns of Delano and McFarland, was voted by a majority of 2 to 1 on April 30. The district has been organized to engage in the distribution of water and power. It is the second such organization formed in the San Joaquin Valley, the Fowler section of Fresno County having voted to form a district a week prior.

ASSOCIATED SALES ENGINEERS

Announce

OPENING OF OFFICE AND WAREHOUSE AT

912 East Third Street, Los Angeles

With sales and service

FOR

AEROVENT FAN MANUFACTURING CO.
Piqua, Ohio
Ventilating Fans.

CLIFTON MANUFACTURING COMPANY
Boston, Mass.
Friction and Rubber Tapes.

R. W. CRAMER & CO.
New York City
Sauter Time Switches.

DIAMOND BRAIDING MILLS
Chicago Heights, Ill.
Flexible Cords.

GOODRICH ELECTRIC CO.
Chicago
Industrial Lighting Reflectors.

HEXACON ELECTRIC APPLIANCE CO.
Roselle Park, N. J.
Soldering Irons and Branders.

HOLTZER-CABOT ELECTRIC COMPANY
Boston, Mass.
Signaling Systems, Program Clock Systems, Fire Alarm Systems.

KLIEGL BROTHERS
New York City
Theatrical and Motion Picture Lighting Equipment.

KWIKON COMPANY
Chicago
Conduit Fittings.

SPECIALTY PORCELAIN COMPANY
East Liverpool, Ohio
Knobs, Tubes, Special Shapes.

HAROLD E. TRENT COMPANY
Philadelphia, Pa.
Electric Furnaces, Strip Heaters, Electrical Heating Specialties.

TOLEDO STANDARD COMMUTATOR CO.
Toledo, Ohio
Standard Motor Coms., Automotive Types, Refills.

One foot or a MILLION, Uniform Quality.

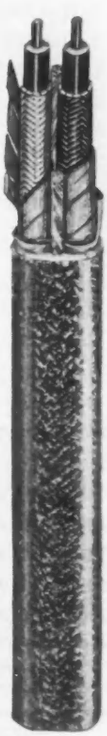
CRESCENT

INSULATED WIRE & CABLE

3 CONDUCTOR EXTRA FLEXIBLE RUBBER JACKETED PORTABLE CABLE

Its Character of these products is such that they give long service and are economical

BUILDING WIRE
ARMORED WIRE & CORDS
AUTOMOTIVE WIRE
APPARATUS CABLE
APPLIANCE CORDS
BELL WIRE
CONTROL CABLES
SPECIAL CORD SETS
EXTENSION CORDS
FLEXIBLE CORDS
FIXTURE WIRE
FLEXIBLE STEEL CONDUIT
HEATER CORDS
HOOK-UP WIRE
INSTRUMENT CABLE
LAMP CORDS
LEAD COVERED
MAGNET WIRE
ORGAN WIRE & CABLE
PARKWAY CABLE
RADIO HARNESS
RADIO WIRE
RUBBER SHEATHED CORDS
TELEPHONE CORDS
SIGNAL CABLES
VARNISHED CAMBRIC
WEATHERPROOF WIRE



CRESFLEX NON-METALLIC SHEATHED CABLE

"Forty-five Years of Knowing How"

CRESCENT INSULATED WIRE & CABLE CO. INC.
TRENTON, NEW JERSEY.

Long Beach Entertains Inspectors Meeting

Long Beach was fully prepared to entertain the Southern Chapter of the International Assn. of Electrical Inspectors for its May 22 meeting. O. W. Newcomb, city electrical inspector, had made all plans to repeat last year's outstanding meeting in that city. The program was to consist of discussion of state safety orders by Frank Short; Art. 9 of the National Electrical Code by R. H. Manahan and inspector's problems discussions by O. W. Newcomb, Long Beach, Oro Shigley, Riverside and R. J. Lyon, of Santa Monica. J. H. Crannell presided over the meeting.

The Long Beach Electrical Contractors Assn. tendered the meeting a complimentary luncheon. In the afternoon a dramatic presentation entitled "Scum," flamboyantly billed as the "most electrifying event of the year." With James Morgan as the star actor supported by Miss Marion Dudley and Gregory Cole, was presented to the augmented audience.

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• FORT COLLINS MUNICIPAL — Beginning April 25, Fort Collins, Colo., started to distribute its own light and power. Although its generating plant will not be in operation for many months—construction work has not yet begun—it began purchasing electricity wholesale from Public Service Co. of Colo., and, under order of the Colorado State Utilities Commission, will continue to receive current from that source until equipped to furnish its own power. Plans for the proposed municipal steam plant have been completed and the city has advertised for bids. Denver brokers are selling Fort Collins income warrant bonds to finance the enterprise which will cost about $750,000.

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• BIDS for furnishing approximately $175,000 worth of high-tension electric switching apparatus for the Diablo power house, now building on the Skagit River, a portion of Seattle's hydroelectric development, were received by the Seattle Board of Public Works. The official bid call provides for furnishing and delivering the apparatus f.o.b. Rockport, Washington.

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• CONSTRUCTION of a $623,573 hydroelectric plant and dam in the Spokane river by the city of Spokane water department was assured recently when the Spokane city council authorized a $500,000 bond issue to meet the city's share of the cost. Officials expect the federal government to grant $185,000 or 30 per cent of the cost of the project.

...about the Trade

Square D Announces Personnel Changes

Numerous changes in the personnel of the Square D Co., Inc., Los Angeles, have been announced by Vernon Brown, president.

A. A. Schueler has been transferred from manager of the San Francisco plant to the position of general sales manager with headquarters in Los Angeles. A. S. Fraser becomes manager of the San Francisco branch. K. L. Sinclair, formerly manager of the clearing house of the Los Angeles Stock Exchange, has been appointed office manager and assistant sales manager of the company.

Robinson Sales Co., Seattle, has been appointed agent-assembler and will assemble Square D panels and switchboards in Seattle and will represent the company and its line in the state of Washington. Frank Strohecker, Seattle, will represent the Square D line of switches, panelboards and switchboards in Oregon. Robinson Sales Co. will represent Square D motor control in Oregon.

H. H. Zimmerman has been transferred to the sales organization of the company.

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Phelps Dodge Appoints George M. Richardson

George M. Richardson, formerly purchase engineer of the Southern California Edison Co. and past president of the National Association of Purchasing Agents, has accepted a position with the Phelps Dodge Copper Products Corp. as district representative in the Pacific Northwest covering Washington, Oregon, western Montana and a portion of Idaho. His headquarters will be with the Graybar Electric Co., Seattle, who are exclusive agents for Phelps Dodge products on the Pacific Coast.

In addition to being active in the purchasing agents association in which he has held practically all offices from president of the Los Angeles association to national head of the organization, Mr. Richardson has been active in the Pacific Coast Electrical Association.

•

• SMOOT-HOLMAN Co., of Inglewood, San Francisco and New York, have placed Leonard Hobbs in charge of all of its products for the northern California territory. Mr. Hobbs formerly had charge only of the lighting equipment division but now has been given charge of all of the porcelain enameled, hotel equipment and lighting equipment branches of the company's business for the northern California territory. A complete stock is being carried at the new address, 154 Eighth St., San Francisco, Calif.

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• NEWBERY ELECTRIC CORP. received the rush contract for the electrical wiring installation in the big Ford Building at the San Diego Exposition. The job was a rush job with only 30 days to finish before the opening of the fair. Between building improvement and the San Diego fair, there proved to be a shortage of electricians in southern California last month.

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• FRANK D. DAVISON, of Phoenix, Arizona, has been appointed representative for Standard Electric ranges in southern Arizona operating under the direction of Wm. P. Swartz, district manager in charge of western sales for The Standard Electric Stove Co.

•

• THERMADOR ELECTRICAL MANUFACTURING Co., Los Angeles, has announced the appointment of General Electric Supply Corp. as a distributor for Thermador electric air heaters in the eleven Western states.

USED TRANSFORMERS

● **IN STOCK FOR IMMEDIATE DELIVERY**

QUANTITY	CAPACITY	MAKE	VOLTAGE
3	1½ K.V.A.	General Electric	2300 to 230/115
4	2 "	Westinghouse	2200 to 220/110
1	3 "	Westinghouse	2300 to 460/230
3	5 "	General Electric	2200 to 220/110
12	7½ "	Westinghouse	2200 to 220/110
1	7½ "	Westinghouse	2200 to 440/220
2	10 "	Westinghouse	2200 to 440/220
3	15 "	General Electric	2200 to 440/220
2	15 "	Wagner	440 to 220/110
3	1½ "	Westinghouse	440 to 220/110
3	3 "	Westinghouse	440 to 220/110
3	5 "	Westinghouse	440 to 220/110
3	7½ "	Westinghouse	440 to 220/110
3	10 "	Westinghouse	440 to 220/110
1-3 phase	25 "	General Electric	2300 to 460/230
2	30 "	Westinghouse	2200 to 440/220/110
3-3 phase	37½ "	Westinghouse	2300/4000 Auto-Transformers
3-3 phase	50 "	General Electric	2300/4000 Auto-Transformers
1-3 phase	100 "	General Electric	2300/4000 Auto-Transformers
1-3 phase	150 "	General Electric	2300/4000 Auto-Transformers
1-3 phase	450 "	Westinghouse	2300/4000 Auto-Transformers
1	200 "	Moloney	4600 to 50/75/100 Electric Furnace Transformers

All of the above Transformers are backed by our 1 year guarantee

JEFFRIES TRANSFORMER CO.

5706 Long Beach Ave., Los Angeles, Calif.

DEPENDABLE TRANSFORMERS SINCE 1923

...about People

"Dick" Northmore Given Forty-two Year Dinner

To commemorate forty-two years of continuous service with the Los Angeles Gas and Electric Corp., E. R. Northmore, the company's superintendent of electric distribution, recently was presented with a parchment scroll by Addison B. Day, president, at a testimonial dinner. The scroll was signed by thirty-eight of his close business associates.

Mr. Northmore, who came to Southern California as a boy in 1876, began his career with the old Los Angeles Electric Co., in 1893 as an apprentice in the arc lamp repair shop. He became superintendent of electric distribution in 1902, and has played an important part in the development and extension of the company's electric properties.

Mr. Northmore is a member of the Electric Club of Los Angeles, the Joint Technical Society, a past vice-president of the American Institute of Electrical Engineers and president of the Joint Pole Committee.

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• H. J. SAYER was recently elected president of the Vancouver Electrical Assn., with S. F. Ricketts as vice-president; J. C. Reston, secretary; T. Smither, treasurer; and T. C. Simmons, D. Niven, A. W. Hunter, T. Barwood, R. Hall, and R. G. Wallace on the executive. Election took place at the third annual dinner of the association in Hotel Georgia, Vancouver.

•

• C. DENT SLAUGHTER, well known on the Pacific Coast as representative of the Anaconda Copper Co., and now located in the New York territory for that company, was a visitor to the Pacific Coast recently.

WHERE TO BUY . . . IN THE WEST

LOCUST PINS

OAK BRACKETS AND POLE STEPS

● SAFETY ● STRENGTH

● LASTING ECONOMY

LOCUST PIN CO. Front Royal Virginia

LAPP
Line Post Insulators

Lapp Line Post Insulators eliminate radio interference due to both dirt and electro-static conditions.

Write for Bulletin No. 112 describing and cataloguing these insulators.

LAPP INSULATOR CO., Inc.
Le Roy, N. Y.

PROVIDENCE INSULATED
Manufacturers of
Type AEIC Service Entrance Cable

Concentrically wound bare neutral conductor, galvanized oval armor, weatherproof and flameproof finish.

For use on entrances without conduit.

Proof Against Theft of Current

Samples and Prices on Request

PROVIDENCE INSULATED WIRE CO.
PROVIDENCE, R. I.

McLAUGHLIN

For Telephone and Telegraph Lines.

GLASS INSULATORS

MAYDWELL & HARTZELL
INCORPORATED
FACTORY DISTRIBUTORS
LOS ANGELES SAN FRANCISCO

DOES YOUR JOB REQUIRE....

SPECIALTIES?

Kortick **welcomes those pole line reconstruction or modernization projects which present problems of special items. For years we have been serving the leading Coast Utilities with equipment of their own design.**

STANDARDS?

Kortick **manufactures and carries a complete line of standard pole line hardware — everything from ground rods to pole top pins. If you have not a copy of our catalogue No. 32, write for it.**

SERVICE?

Kortick **maintains complete warehouse stocks at San Francisco, Los Angeles, Portland and Seattle and guarantees prompt shipment of all orders.**

This Tag Is Your Assurance of Quality

KORTICK

MANUFACTURING COMPANY

OFFICE—PLANT—WAREHOUSE

345 FIRST ST.
SAN FRANCISCO
Telephone GArfield 8080

Maj. Fox Given Charge of Second District

Major Milo P. Fox, a member of the Board of Engineers for Rivers and Harbors, in Washington, D. C., has been assigned to the office of the Northwest Division of the Army Engineers at Portland, Ore., to take charge of one of two districts into which the Portland District has recently been divided. Major Fox will take responsibility for District No. 1 defined as the Columbia River drainage area below Vancouver, Wash., and the Oregon coast.

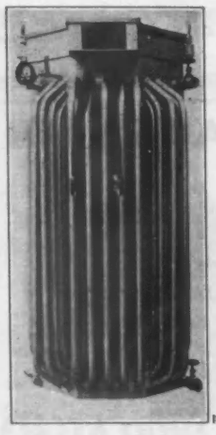
District No. 2, including the Columbia above Vancouver, Wash., to the mouth of the Snake and including the Snake River will be under the direction of Major Charles F. Williams, who formerly had charge of the entire Columbia district. Major Williams' district includes the Bonneville development under construction and the projects above that point to the mouth of the Snake under consideration. Both districts remain under the jurisdiction of Colonel Thomas W. Robbins, division engineer.

•

• M. L. Foess, widely known in the Pacific Coast radio trade, recently joined the sales organization of the Associated Wholesale Electric Co., Los Angeles. He will handle the Atwater-Kent line, for which the company is distributor.

•

• Clyde L. Seavey, former president of the California Railroad Commission, who was appointed to the Federal Power Commission by President Roosevelt last year, has been re-appointed for a five-year term.



Want to SAVE Money — on TRANSFORMERS?

★ Because we are specialists in the transformer field we can manufacture transformers better and at a saving to our customers. Twenty-five years of experience enables us to build reliable transformers to meet every specification.

We have equipped our modern plant to render the finest transformer service in the West, both for economical repairing and for quick order filling on new transformers in all voltages and sizes.

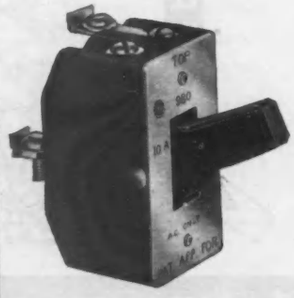
Write or call our nearest agent for satisfactory transformer service.

GARDNER ELECTRIC MFG. CO.

4227 Hollis Street — Emeryville, Calif.

SEATTLE—Nicolay Sales Co., 304 Westlake North; PORTLAND—Earl Gooding Co., Security Bldg.; DENVER—Kranefeld Eng. Co., 3417 E. 14th Ave.; LOS ANGELES—Utilities Supply Co., 1736 E. 15th St., Decla Sales Co. (Neon Only) 342 Towne St.

"Diamond H" brings out a new kind of HEATER SWITCH



"980" A TOGGLE TYPE SWITCH

for AC current with a slow break action, for the modern electric range or appliance. This new series of switches are made for 2 heat or 3 heat balanced load and many other circuits. Because of an entirely new construction these switches give unusual service and are easy to install and wire. Made in single units, or in four or five switches in a single unit.

Another new device is the S2 Thermostat with remote control for electric ranges and water heaters. Controlled from front panel—But get acquainted with up to the minute devices. Bulletins 13-A and 17 will help you. Send for it.

The Hart Mfg. Co., Hartford, Conn.

...in New Equipment

Smaller Three-Light Lamps

Development of a new inside-frosted lamp, designed primarily for the I. E. S. portable study lamps, has been announced by the Incandescent Lamp Department of the General Electric Co., Nela Park. The new lamp is of the three-light type and contains two filaments, one of 50 watts and one of 100 watts, each of which may be burned individually or in combination with the other. It is equipped with a mogul three-contact base.

●

Refrigerator Testers

To facilitate the sale of electrical refrigerators the Practical Instrument Co., Chicago, Ill., has brought out a set of three refrigerator testing instruments comprising a room temperature recorder, a box temperature recorder and a compressor operating recorder. The recorders are designed to provide a 24-hour performance record of a refrigerator. They are installed in a bakelite case and include a 36-hour manually operated New Haven clock movement for operating the charts.

●

All Rubber Lamp Cord

A newly designed type of all-rubber parallel lamp cord has been announced by the General Electric Co.'s Merchandise Department, Bridgeport, Conn. Designated as type PO-SJ "Special," the new cord is unusual in that both copper conductors are insulated simultaneously with at least a 1/32-in. wall of rubber. The cord has a series of longitudinal ridges in its outer surface and is available in brown, ivory, black and olive. It carries Underwriters' bracelet label every 5 ft.

●

New Mixmaster Motor

Feature of the new Sunbeam Mixmaster just announced by the Chicago Flexible Shaft Co., Chicago, Ill., is automatic power control which permits full power on every speed. This is made possible by a new type governor-controlled motor. The new Mixmaster can be set for any speed desired and it automatically holds that exact speed no matter how increasingly heavy the batter becomes. Another feature is larger paddle surfaces on the beaters. In addition a leak-proof oiling system has been devised for the beater bearings. List price of the new Mixmaster is $23.25 in this territory.

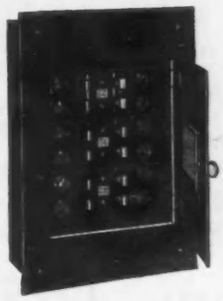
Self-Starting Clocks

A complete new line of self-starting electric clocks, all featuring the speedometer type dial, has been placed on the market by the Pennwood Co., Pittsburgh, Pa. These new time pieces are available in a wide variety of designs, including one for wall mounting. Models range in price from $5.95 to $19.50. The Pennwood movement is also available for adaptation to radios, ranges and other appliances incorporating clock equipment.

●

Two New Ironers

Merchandise Division of the Westinghouse Electric & Manufacturing Co., Mansfield, Ohio, announces two new ironers to complete the line offered by that company. One is a cabinet ironer which is fully enclosed in a porcelain enamel cabinet that automatically swings to the desired position as a storage table at the touch of a button. The second is a standard iron similar in every detail but not equipped with the enclosed top.



Switch Centers

A new line of switched fuse cabinets termed "Switch-Centers" is announced by Bull Dog Electric Products Co., Detroit, Mich. The line is available in 4, 8 and 12 circuits single phase and 8 and 12 circuits, three phase four wire. Toggle switches are 30-amp. capacity of a new type known as "NID" which features floating contacts, frictionless snap-action mechanism and unbreakable handles. The switches are removable from the panel without removing the cabinet front. Plug fuse circuits also incorporate patented quick-wiring connectors.

●

Kva. Recording Meter

Esterline-Angus Co., Indianapolis, Ind., announces a new kilvolt-ampere recording instrument designed for use in making a continuous record of electrical energy. The new instrument embodies the standard model A. W. wattmeter in conjunction with a phase shifting network which supplies the wattmeter with a lagging potential corresponding to the average power factor of the circuit. A tap is provided on the phasing network to permit measurement of reactive volt-amperes with the same instrument. By omitting the network, the instrument can be used also as a graphic wattmeter. It is available in a wide variety of ranges and with ten different chart speeds.

New Distribution Transformers With Lighting Protection

New distribution transformers with self-contained lightning protection by means of valve-type lightning arresters, have been announced by the General Electric Co., Schenectady, N. Y. In addition the transformers have interiors of new electrical design, new mechanical structures, new clamp-terminal bushings, and new tank finishes. Lightning protection is provided by a valve-type Thyrite lightning arrester which is combined with a removable pocket-type high-voltage bushing and installed as part of the transformer, being sealed in that portion of the bushing which is external to the tank.

●

Wiring and Motor Calculator

An accurate and handy pocket calculator for computing wiring and motor data is being distributed by the Square D Co., Inc., Los Angeles. The new calculator is a duplicate of one which was first offered two years ago, but is now priced at $2.50. The calculator computes in one operation all of the necessary information regarding each type of motor for each rated horsepower. A simple turn of the dial to horsepower of the motor gives wire size, conduit size, amperes starting current, and other information necessary for proper installation. The wiring calculator will figure any one of four items: amperes, feet of wire, size of wire or per cent drop.

●

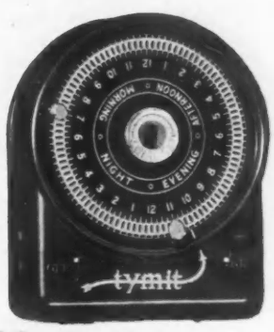
Brass-to-Glass Bushing

The Hemingray Division of the Owens-Illinois Glass Co., Muncie, Ind., has announced the perfecting of a process whereby a brass bushing is inserted into the hot plastic glass during the formation operation of Hemingray insulators. This bushing is locked into position automatically, requiring no cement or alloy to hold it in place. As a result the claim is made that the bushing assures smooth, perfect pin threads, eliminates breakage due to pin expansion and causes no radio interference. Another advantage claimed is greatly increased mechanical strength. Higher dielectric properties are also characteristic of the new insulator.

●

New Tork Time Switch

A new portable plug-in type time switch for general domestic uses known as "Tymit" has been announced by the Tork Clock Co., Inc., Mt. Vernon, N. Y. With a standard 24-hour dial with adjustable operating arms and complete freedom of manual control, the switch will provide time control of radios, refrigerators, protective lighting, portable heaters, fans, window signs and spotlights. It is also available for wall mounting as a permanent control for oil burners, furnace control, store window lights, or poultry house lighting. It has a capacity of 660 watts in the portable type and 1,500 watts for the wall mounting type.



...in Trade Literature

GENERAL ELECTRIC CO. has published a series of nine bulletins which together are incorporated in one folder under the heading "An Opportunty to Improve Voltage Profitably." The bulletins cover generator-voltage regulators, station-type induction voltage regulators, branch-feeder induction voltage regulators, branch-feeder step voltage regulators, branch-feeder step voltage boosters, step voltage regulators for higher-voltage circuits, series capacitors for reducing lamp flicker and autotransformers for reducing lamp flicker.

DIRECT CURRENT MOTORS and generators, known as type E, are described in bulletin 2183 just published by the Allis-Chalmers Manufacturing Co., Milwaukee. A second leaflet known as No. 2100 discusses wound rotor induction motors.

●

NATIONAL SWITCH BOXES, manufactured by the National Electric Products Corp., Pittsburgh, are described and cataloged in a new booklet just released. Listed and illustrated is every National switch box that may be used with each wiring system and the connectors or fittings that are necessary to complete an installation.

●

REVISED SPORTS lighting layouts covering a wide range of applications have just been issued by the Benjamin Electric Manufacturing Co., Des Plaines, Ill. The layouts cover softball fields, tennis courts, football, baseball and athletic fields, swimming pools, trap shooting and skeet shooting, horseshoe pitching, race tracks and putting greens.

●

HUBBARD AND CO., Pittsburgh, Pa., and Oakland, Calif., has just issued Catalog No. HT-34 covering "Wood Pole Construction for Transmission Lines." Described is the entire line of Hubbard fittings for this type of construction as well as illustrations and drawings showing the applications.

●

HOOK OPERATED disconnect switches are described in Bulletin No. 44 recently published by the Pacific Electric Manufacturing Co., San Francisco. Specifications and detailed drawings are included in the new publication.

WHERE TO BUY IT IN THE WEST

Air Conditioning
Frigidaire Corp.
General Elec. Co.
Graybar Elec. Co., Inc.

Anchors, Guy
James R. Kearney Corp.

Appliances, Household
Apex Rotarex Mfg. Co.
Edison Gen. Elec. Appliance Co., Inc.
General Elec. Co.
General Elec. Supply Corp.
Graybar Elec. Co., Inc.
Lindemann & Hoverson Co., A. J.
Malleable Iron Range Co.
Swartzbaugh Mfg. Co.
Westinghouse Elec. Supply Co.

Boxes
General Cable Corp.
General Elec. Co.
Russell & Stoll Co.

Brackets, Wood
Locust Pin Co.

Bus Fittings
Burndy Eng'g Co.
General Elec. Co.

Buses
Aluminum Co. of America ..

Cable Accessories
General Cable Corp.
General Elec. Co.
John A. Roebling's Sons Co.

Cables
Aluminum Co. of America
American Steel & Wire Co.
Columbia Steel Co.
Crucible Steel Co. of America
General Cable Corp.
General Elec. Co.
Graybar Elec. Co., Inc.
Maydwell & Hartzell, Inc.
Providence Insulated Wire Co.
John A. Roebling's Sons Co.
Westinghouse Elec. & Mfg. Co.

We Manufacture and Distribute
Electrical Construction Materials

Joslyn Company
of California

JOSLYN HOT-GALVANIZED
POLE LINE HARDWARE

Manufactured in the West to meet Western needs

Representing

PINCO Insulators
EVERSTICK Anchors
MOHAWK Conduit
PLYMOUTH Insulating Tapes, Rubber and Friction
BULLDOG Knobs, Insulators, Tubes, Cleats, etc.
DOLPH Insulating Varnish
PHILADELPHIA Magnet and Annunciator Wire
BURNLEY Soldering Pastes
HYKON Boring Device
COLUMBUS Sturd E Tools
WESTERN Red Cedar Poles
Fir Cross Arms
Wood Pins and Brackets
Steel Strand

Factory
5100 District Blvd., Los Angeles

District Office
969 Folsom St., San Francisco

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CARBON BRUSHES

Make use of the services of our San Francisco Sales Office and Brush Finishing Plant.

PROMPT DELIVERY
ON ALL GRADES OF
National Pyramid Brushes

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Carbon Brushes
National Carbon Co., Inc.

Carbon Products
National Carbon Co., Inc.

★ FOR ALL UNDER-GROUND WIRING

Soapstone Duct

★ FIRE PROOF WALL CO.
354 Hobart St., Oakland

Central Station Equipment
Tom Wood

Chimes
Square D Co., Inc.

Circuit Breakers
General Elec. Co.
I-T-E Circuit Breaker Co.
Westinghouse Elec. & Mfg. Co.

Cleaners, Vacuum
Apex Rotarex Mfg. Co.
Clements Mfg. Co.
Cramer Elec. Co.

Coil Winding
Jeffries Transformer Co.

Compounds, Insulating
John C. Dolph Co.
General Cable Corp.
General Elec. Co.

Condensers, Electric
Allis-Chalmers Mfg. Co.
J. G. Corrin
General Elec. Co.
Westinghouse Elec. & Mfg. Co.

Controllers
Clark Controller Co.

Conduit
Aluminum Co. of America
General Elec. Co.
Youngstown Sheet & Tube Co.

Conduit, Underground
Fire Proof Wall Co.
Johns-Manville Corp.

Connectors
Burndy Eng'g Co.
James R. Kearney Corp.

Cutouts
James R. Kearney Corp.
General Elec. Co.
Westinghouse Elec. & Mfg. Co.

Demand Control
General Elec. Co.
Wesix, Inc.

Distribution Specialties
General Elec. Co.
James R. Kearney Corp.
W. N. Matthews Corp.
Maydwell & Hartzell, Inc.
St. Louis Malleable Casting Co.

Electrodes, Arc Welding
John A. Roebling's Sons Co.
General Elec. Co.

Fans
General Elec. Co.

Farm Electrification Equipment
General Elec. Co.

Fittings, Conduit
General Elec. Co.

Fixtures, Lighting
General Elec. Co.
Russell & Stoll Co.
Smoot-Holman Co.

Floodlighting
General Elec. Co.
S & M Lamp Co., Inc.
Smoot-Holman Co.

Fuses
Trico Fuse Mfg. Co.

Gasoline
Union Oil Co.

Generators
Allis-Chalmers Mfg. Co.
General Elec. Co.
Westinghouse Elec. & Mfg. Co.

Graphite Products
National Carbon Co., Inc.

Ground Rods
Crucible Steel Co.
Maydwell & Hartzell, Inc.

Heaters, Air
Edison Gen. Elec. Appliance Co.
Montgomery Bros.
Noblitt-Sparks Industries, Inc.
Sandoval Sales Co.
Thermador Elec'l Mfg. Co.
Wesix Inc.
Edw. L. Wiegand Co.

Heaters, Water
Edison Gen. Elec. Appliance Co.
Lindemann & Hoverson Co., A. J.
Malleable Iron Range Co.
Sandoval Sales Co.
Thermador Elec'l Mfg. Co.
Wesix Inc.
Westinghouse Elec. & Mfg. Co.

Heating Element—Repair Part
Mend-It Sleeve Mfg. Co.
Edw. L. Wiegand Co.

Illuminating Glassware
Inland Glass Works, Inc.

Instruments, Measuring and Recording
The Bristol Co.
General Elec. Co.
Quality Elec. Co.
Roller-Smith Co.
Westinghouse Elec. & Mfg. Co.
Weston Elec'l. Instrument Corp.

UNIFORMITY

IS THE OUTSTANDING CHARACTERISTIC OF
"SA" SERIES BRUSHES
FOR HEAVY DUTY D. C. SERVICE

In addition to the regular trade marks — the Three Pyramids, the Silver Strand Cable and the Grade Number — these new grades are further identified by the Double Engraved Lines (Trade Mark Registered) down the center of the brush.

THE exceptional uniformity of "SA" Series brushes — uniformity in performance as well as in physical properties — marks a definite advance in brush manufacture. It eliminates the brush variable from machine performance.

These new electro-graphitic brushes, SA-25, SA-30, SA-35, SA-40 and SA-45, are progressively graded in commutating properties and cover a wide range of application on heavy duty equipment.

Write for specific recommendation for your heavy duty D. C. service.

NATIONAL CARBON COMPANY, INC.
Carbon Sales Division, Cleveland, Ohio
Unit of Union Carbide and Carbon Corporation
Branch Sales Offices: New York · Pittsburgh · Chicago · San Francisco

Where to Buy It in the West—*Continued*

Insulation
General Elec. Co.
Johns-Manville Corp.
C. D. LaMoree

Insulators
Corning Glass Works
Graybar Elec. Co., Inc.
Hemingray Glass Co.
Illinois Elec. Porcelain Co.
Lapp Insulator Co., Inc.
Locke Insulator Corp.
McLaughlin Glass Co.
Owens-Illinois Glass Co.
Westinghouse Elec. & Mfg. Co.

Ironers
Apex Rotarex Mfg. Co.
General Elec. Co.
Ironite Ironer Co.
Mary Dowd Reardon Studios
Savage Distributing Co.
Gordon E. Wilkins

Lamps, Mazda
General Elec. Co.
Westinghouse Lamp Co.

Lamps, Student
Lumidor Mfg. Co., Inc.

Lamps, Sun
General Elec. Co.

Public Utilities
California Oregon Power Co.
Idaho Power Co.
Mountain States Power Co.
Northwestern Electric Co.
Pacific Gas and Electric Co.
Pacific Power & Light Co.
Portland General Electric Co.
Puget Sound Power & Light Co.
San Diego Cons. Gas & Elec. Co.
San Joaquin Light & Power Corp.
Southern California Edison Co. Ltd.
Utah Power & Light Co.
Washington Water Power Co.

Pumps
Pelton Water Wheel Co.

Range Units
Edison Gen. Elec. Appliance Co.
Edwin L. Wiegand Co.

Ranges
Edison Gen. Elec. Appliance Co.
General Elec. Co.
General Elec. Supply Corp.
Lindemann & Hoverson Co., A. J.
Malleable Iron Range Co.
Standard Elec. Stove Co.
Walker & Pratt Mfg. Co.

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Arizona—Tucson: Albert Steinfeld & Co. California—San Francisco: Kaemper-Barrett Corp., The Geo. H. Eberhard Co. Los Angeles: Listenwalter & Gough, Graham-Reynolds Elec. Co. Nevada—Reno: H. E. Saviers & Son. Utah—Salt Lake City: W. H. Bintz Co. Washington—Tacoma: Home Electric Co. Honolulu, T. H.—von Hamm-Young Co., Ltd.
Pacific Coast Sales Manager: WM. P. SWARTZ
629 S. Serrano, Los Angeles, Calif.

Lighting Equipment
Smoot-Holman Co.
Wuelker Flexo-Dome Co.

Line Material
Maydwell & Hartzell, Inc.

Meters
The Bristol Co.
General Elec. Co.
L. A. Nott
Sangamo Elec. Co.
Westinghouse Elec. & Mfg. Co.
Weston Elec'l Instrument Corp.

Molded Material
C. D. La Moree

Motors
Allis-Chalmers Mfg. Co.
General Elec. Co.
Westinghouse Elec. & Mfg. Co.

Motor Starters
Allis-Chalmers Mfg. Co.
General Elec. Co.
Ward Leonard Elec. Co.
Westinghouse Elec. & Mfg. Co.

Oil, Lubricating
Associated Oil Co.
Union Oil Co.

Oil, Transformer & Switch
Associated Oil Co.
General Elec. Co.
Union Oil Co.

Panel Boards
General Elec. Co.
Westinghouse Elec. & Mfg. Co.

Photoelectric Cells
General Elec. Co.
Weston Elec'l Instrument Corp.

Pins, Wood
Locust Pin Co.

Pole Line Hardware
General Electric Supply Corp.
Graybar Electric Co., Inc.
Hubbard & Company
Joslyn Co. of Calif.
Kortick Mfg. Co.
Locke Insulator Corp.
Maydwell & Hartzell, Inc.

Refrigerator Parts & Accessories
California Refrigerator Co.

Refrigerators
Frigidaire Corp.
General Elec. Co.
General Elec. Supply Corp.
Graybar Elec. Co., Inc.
Malleable Iron Range Co.
Westinghouse Elec. & Mfg. Co.

Relays
General Elec. Co.
Leach Relay Co.
Ward Leonard Elec. Co.

Rheostats & Resistors
General Elec. Co.
Ward Leonard Elec. Co.
Westinghouse Elec. & Mfg. Co.

Service Organizations
Elec'l Testing Labs.
Fort Wayne Correspondence School
McGraw-Hill Book Co.
Northwest Elec. Light & Power Association
Pacific Coast Elec'l Ass'n
Pacific Coast Elec'l Bureau

Strand, Guy
Crucible Steel Co.
Maydwell & Hartzell, Inc.
Pacific Wire Rope Co.

Switchboards
Allis-Chalmers Mfg. Co.
General Elec. Co.
Square D Co., Inc.

Switches, Coin Operated
Welcome Meter Co.

Switches, High Tension
Bowie Switch Co.
James R. Kearney Corp.
General Elec. Co.
C. D. LaMoree
Pacific Elec. Mfg. Co.

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PRESENTS FLEXO-DOME
A flexible lighting unit, mechanically perfect, fireproof, weatherproof, having its own socket, independent wiring system, and aluminum reflector, with stops and set-screws to control rigid adjustment of floodlight to any and all angles, and ready for instant connection to supply wires.
FOR INTERIOR AND EXTERIOR ILLUMINATION OF EVERY KIND
RECENTLY PERFECTED FOR MACHINE-SHOP USE ON
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"FLEXO-DOME DIRECTS THE LIGHT"
WRITE FOR CATALOGUES

Where to Buy It in the West—Continued

Switches, Meter Test
General Elec. Co.
Meter Devices Co.

Switches—Pressure and Temperature
The Bristol Co.
Garland-Affolter Eng'g Corp.

Switches, Safety
Colt's Patent Fire Arms Mfg. Co.
Meyers Safety Switch Co., Inc.
Mongerson's Elec'l Mach. Works.
Parker Elec'l Mfg. Corp.
Square D Co., Inc.

Switches, Time
R. W. Cramer & Co.
General Elec. Co.
Sangamo Elec. Co.
Tork Clocks, Inc.

Switchgear
Allis-Chalmers Mfg. Co.
Condit Elec'l Mfg. Corp
General Elec. Co.
Pacific Elec. Mfg. Co.
Westinghouse Elec. & Mfg. Co.

Terminals, Cable
General Cable Corp.
General Elec. Co.

Testing Devices
Electrical Facilities, Inc.

Tools, Live Line
James R. Kearney Corp.

PARTS & ACCESSORIES
***For* SAVAGE** Washers & Dryers
• PROMPT DELIVERY
• COMPLETE STOCKS
Savage Distributing Co., Inc.
383 Brannan St., San Francisco

Washers, Clothes
Apex Rotarex Mfg. Co.
Elec't Appliance Service Corp.
General Elec. Co.
Little Giant, Inc., Ltd.
Savage Distributing Co.
Washing Machine Parts Co.

Authorized Factory Replacement Parts Service
•
Automatic, Easy, Gainaday, Horton, Meadows, Roto Verso and Universal Washers and Ironers
Parts and Rolls for All Makes
Washing Machine Parts Co.
1241 S. Hope St., Los Angeles

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***Repair Service* for distribution transformers, Auto-starters and similar equipment.**
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Electric Agencies, 2059 Webster St., Oakland, California

Transformers
Allis-Chalmers Mfg. Co.
American Transformer Co.
E. H. Bell
Gardner Elec. Mfg. Co.
General Elec. Co.
Jeffries Transformer Co.
Pennsylvania Transformer Co.
Sangamo Elec. Co.
Western Transformer Co.
Westinghouse Elec. & Mfg. Co.

TRANSFORMERS
Dry Type — Neon Power
Western Transformer Co.
618 E. 11th St., Oakland, California

Tubing, Elec'l Metallic
Aluminum Co. of America

Turbines
Newport News Shipbuilding & Dry Dock Co.
Pelton Water Wheel Co.

Valves
Pelton Water Wheel Co.

Water Wheels
Pelton Water Wheel Co.

Wire
Aluminum Co. of America
American Steel & Wire Co.
Columbia Steel Co.
Crescent Ins. Wire & Cable Co.
Crucible Steel Co.
Driver-Harris Co.
General Cable Corp.
H. B. Squires Co.
Westinghouse Elec. Supply Co.

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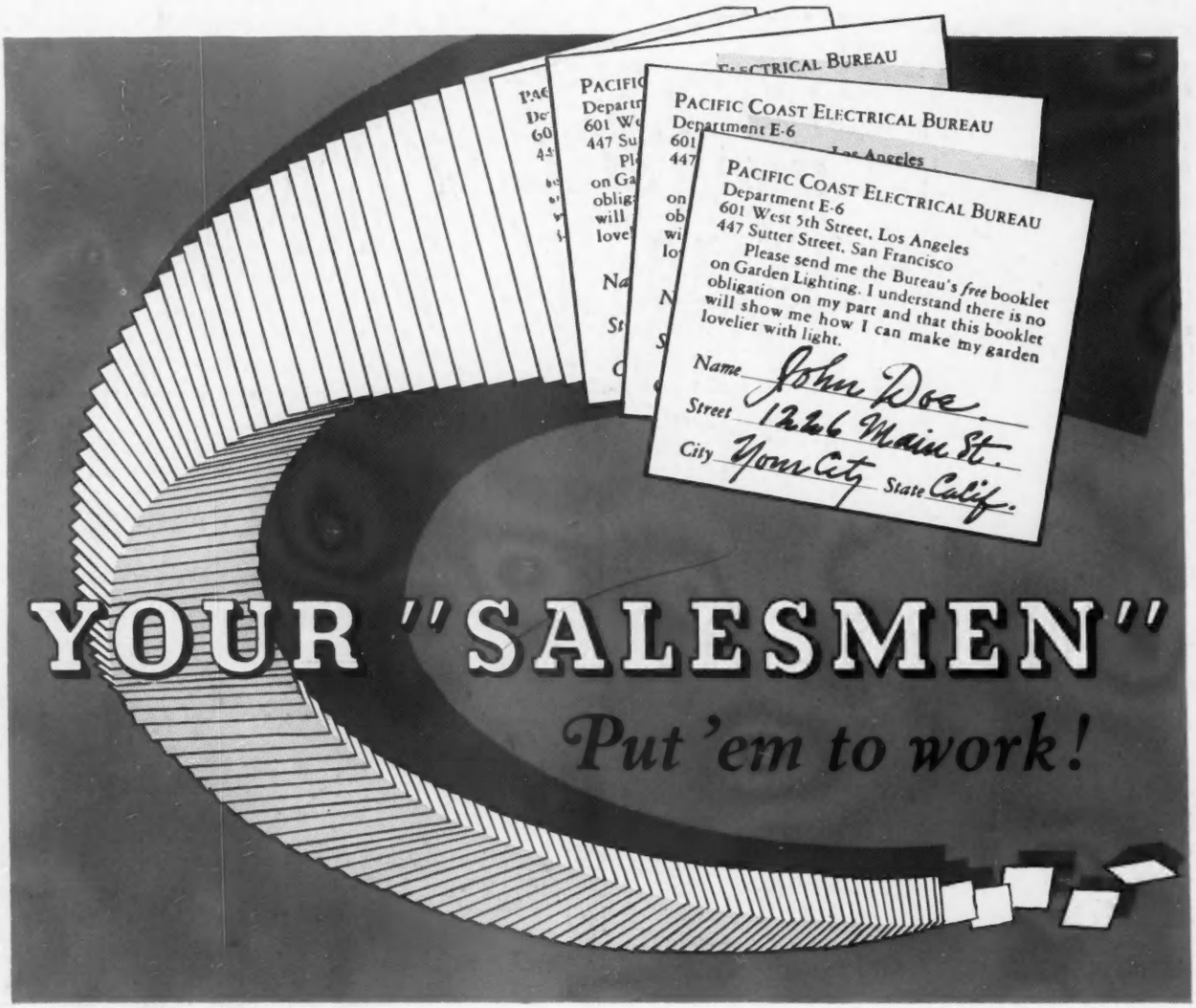
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